THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

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GAS PURIFICATION
BY
OXIDE OF IRON.

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GENUINE TORBAY PAINT
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Several Prize Medals. Established over 20 Years.
These Paints are now used in over 200 Country Gas-Works, and by all the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov. 2, 1866.*
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CONTRACTOR FOR
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FOR
Gas, Water, & Sanitary Purposes,
AND MANUFACTURER OF
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FOR
SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
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Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
Manufacturers of
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
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OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
Manufacturers of
WET AND DRY GAS-METERS,
Licensees and Manufacturers of
HUNT'S
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
Established 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
Manufacturers of
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
Roofs, Girders, and Bridges, and General Smith's Work.
London Offices: 97, CANNON STREET—
JAMES E. & SAMUEL SPENCER, Agents.

THE
"OTTO" GAS-ENGINE.
See Page 126.

CROSSLEY BROTHERS,
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NITSHILL COMPANY'S
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
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DRY GAS-METER MANUFACTURERS.
HAVE REMOVED TO MORE EXTENSIVE PREMISES:

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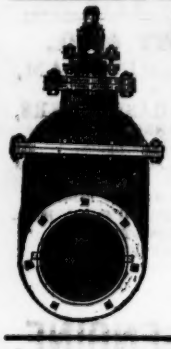
WELLINGTON TUBE WORKS,

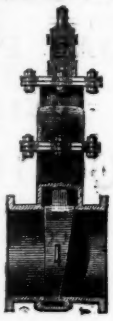
GREAT BRIDGE, TIPTON, STAFFORDSHIRE.

JOSEPH AIRD,

GAS, STEAM, AND HYDRAULIC TUBES AND FITTINGS.



C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

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EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.

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CONTRACTORS FOR GAS & WATER WORKS, GENERAL ENGINEERS, IRONFOUNDERS & MANUFACTURERS OF

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SCRUBBERS, VALVES, EXHAUSTERS, IRON ROOFS, BRIDGES, BOILERS, AND GENERAL CAST AND WROUGHT IRON WORKS.

S. C. & Sons undertake the entire erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the supplying and laying of MAINS.

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For further Particulars, apply to Mr. F. MORRIS, GAS-WORKS, BRENTFORD, or to S. CUTLER & SONS, PROVIDENCE WORKS, MILLWALL (Near the Steamboat Pier), LONDON, E.

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By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

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Drawings, Specifications, and Estimates supplied on application.

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SPECIAL METALLIC OXIDE PAINT,

Largely used by Gas Companies, Corporations, Railway Companies, Ironfounders, and Machinists. It has the following qualifications and properties:—

EFFECTUALLY PREVENTS AND ARRESTS CORROSION.
HAS A FINE GLOSS, AND IS VERY DURABLE.
DOES NOT REQUIRE DRIERS LIKE OTHER PAINTS.
PROTECTS IRON FROM ACTION OF WATER.

IS NOT AFFECTED BY SULPHURETTED HYDROGEN.
FORMS A VERY HARD TOUGH (NOT BRITTLE) SURFACE.
WILL NOT CRAC., BLISTER, OR SCALE
IS NOT AFFECTED BY EXTREMES OF TEMPERATURE.

COVERS NEARLY DOUBLE THE AREA OF OTHER PAINTS.
(7 gallons or 1 cwt. will cover 1211 square yards of Ironwork.)
IS CHEAPER AND MORE ECONOMICAL THAN ANY OTHER.

VICTORIA PAINT WORKS, COLLYHURST, MANCHESTER.

HYDRATED PURIFYING MATERIAL.

Samples on application.

MESSRS. SPENCE BROS., LIMITED,

Will be glad to supply the above on the most favourable terms, and to treat, by Purchase or Exchange, for Spent Oxide.

PRICES ON APPLICATION.

ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.

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STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

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BY

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GAS PURIFICATION & CHEMICAL Co., LIMITED,

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

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LIMITED,

DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: W. M'GOWAN,

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

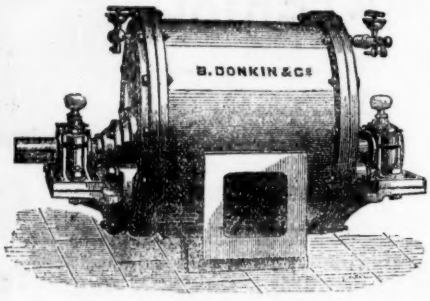
Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.



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NEW PATENT GAS-EXHAUSTERS,

For the Manufacture of which

MESSRS. B. DONKIN & Co.

POSSESS THE SOLE RIGHT.

Made with two Outside Bearings and with all the Latest Improvements.

FULL PARTICULARS ON APPLICATION.

BERMONDSEY, LONDON, S.E.

Messrs. B. D. & Co. are also Manufacturers of Steam-Engines and of Improved Gas and Water Valves, &c., &c.

GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER.

MANUFACTURED BY GUEST AND CHRIMES,

FOUNDRY AND GENERAL BRASS WORKS, ROTHERHAM;

AND 85, SOUTHWARK ST., LONDON, S.E.

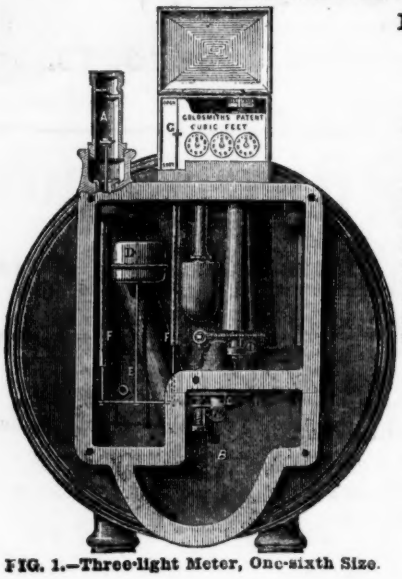

FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

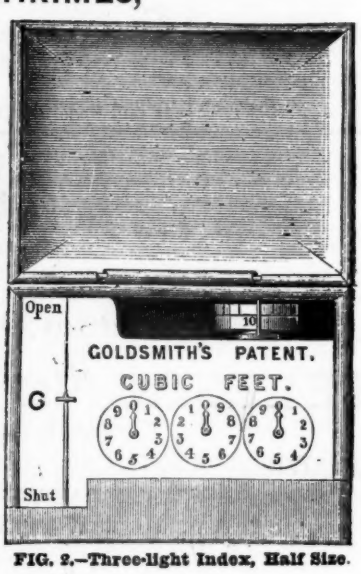

FIG. 2.—Three-light Index, Half Size.

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

LONDONDERRY GAS COALS

DIRECT FROM THE

MARQUESS OF LONDONDERRY'S COLLIERIES.

COUNTY OF DURHAM.

For Prices and Particulars, apply to

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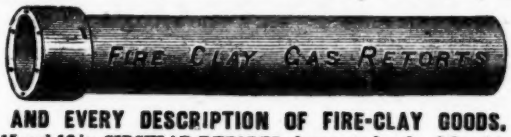
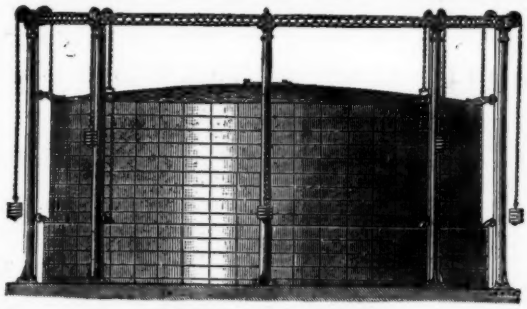
JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,



AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.



J. T. B. PORTER & CO.,

GAS ENGINEERS & MANUFACTURERS,

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GOWTS BRIDGE WORKS,

LINCOLN.

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ESTIMATES FOR GAS-WORKS OF ANY SIZE.

REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

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WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,

DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

FINSBURY CIRCUS, LONDON.

ESTABLISHED IN 1860.

BENJAMIN CARPENTER,

THE ORIGINAL MANUFACTURER OF THE IMPROVED

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,

22, HERMES STREET, PENTONVILLE ROAD,

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The Dunston Engine Works Co.,

GATESHEAD-UPON-TYNE.

Are the Sole Manufacturers of

Archer's Patent Hoists,

ALSO OF

Archer's Patent Stone Breaker,

AND OF

Archer's Patent Ore Crusher & Pulveriser,

The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

GRIRDROD'S PATENT

PORTABLE PIPE SCREWING MACHINE,

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,

Brassfounders, Gauge Injector and Tool Makers,

ALBION WORKS, SALFORD,

LANCASHIRE.

Gold Medal Awarded, Paris Exhibition, 1878.

THOMAS TURTON AND SONS,

SHEAF AND SPRING WORKS,

SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS,

STEEL OF ALL DESCRIPTIONS,

SCREW STOCKS, TAPS, AND DIES, SPANNERS, RATCHET BRACES, LIFTING-JACKS, ANVILS, VICES,

AND ENGINEERS TOOLS GENERALLY.

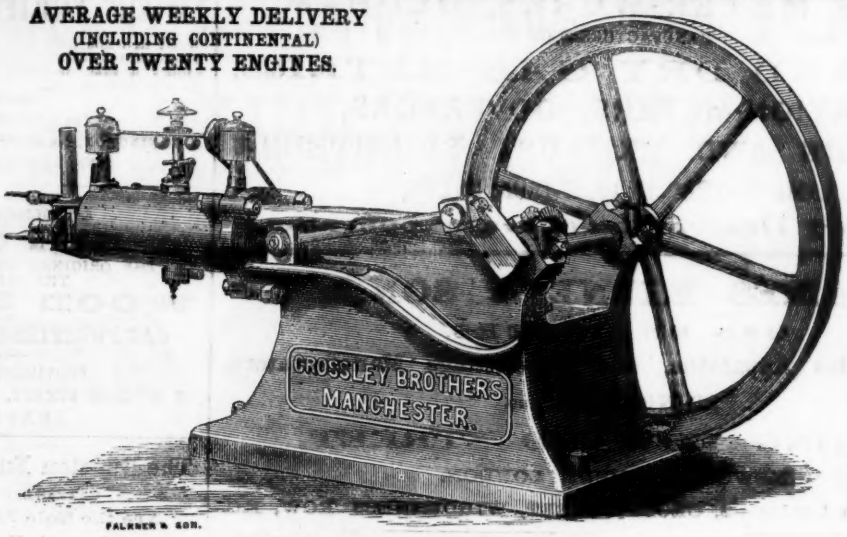
LONDON OFFICE:

90, CANNON STREET, E.C.

AN ENGINE WHICH WORKS WITHOUT A BOILER OR STEAM

AVERAGE WEEKLY DELIVERY
(INCLUDING CONTINENTAL)
OVER TWENTY ENGINES.

The durability of these Engines is now established by experience, one of them having run night and day at the Hinckley Gas-Works for over Twelve months without any expenditure for repair; this being equal to about 2½ years average work.



Over 1900 already delivered.

Very numerous Testimonials from Users, including Engineers, Men of Science, and others, on application to the makers.

No trouble with Coal, Ashes, Smoke, Insurance, Water, or constant attendance.

No Glands to pack, or Water Gauges and Steam Gauges to watch.

STARTS AT A MOMENT'S NOTICE.

THE "OTTO" SILENT GAS-ENGINE.

(Otto and Crossley's Patents, 1876 and 1877.)

THEY ARE USED FOR ALL KINDS OF PURPOSES, CHIEFLY FOR EXHAUSTERS, SCRUBBERS, & PUMPS.

DELIVERED IN MANCHESTER. SIZES { NOMINAL HORSE POWER ½ 1 2 3½ 6 8 12 16 / MAXIMUM HORSE POWER ¾ 1½ 2½ 4 9 12 18 24 } OFFERED. CASES NOT CHARGED IF RETURNED FREE

PRICES INCLUDE CAST-IRON STAND, TURNED FLY-WHEEL, AND DRIVING PULLEY; WATER-VESSEL, SEVERAL DUPLICATES, AND GAS-FITTINGS (EXCEPTING METER AND PIPES).

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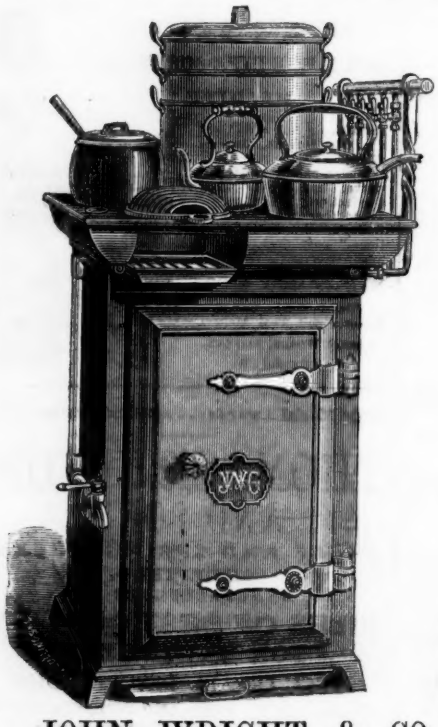
MANCHESTER.

THE NEW GAS COOKER.

40 PER CENT. OF GAS SAVED.



No. A510 same as our **No. A152,**
But Lined with Patent Non-Conductor.
Will Roast, Bake, and Fry, and with Three Burners for Boiling.

SIZE.
Outside—30in. high, 20in. wide, 20in. deep.
Inside—19½in. „ 14in. „ 17in. „

Price . . . . . **£4 14s. 6d.**

No. A500.
Lined with Patent Non-Conductor.
Is fitted with Roasting and Baking Oven and Four Burners for Boiling.

SIZE.
Outside—34in high, 20in. wide, 19in. deep.
Inside—30in. „ 16in. „ 17in. „
Hot Plate—24in. by 23in.

Price . . . . . **£7 10s. 0d.**

No. A505.
Same as with Roasting and Baking Oven, a Broiler or Toaster, a Chop Griller, a Hot Water Boiler, and Three Burners for Boiling.
Hot Plate—26in. by 24in.

Price . . . . . **£9 15s. 0d.**

These Cookers are jacketed, on the sides, top, and door, with a new and very efficient non-conducting material, by the use of which a **saving** of gas to the extent of **40 per cent.** is effected.

Gas Companies who are selling or hiring stoves should see these stoves. Catalogues and particulars on application to

JOHN WRIGHT & CO., ESSEX WORKS, BROAD STREET, BIRMINGHAM.

London Warehouses: { 155a, Upper Thames Street, / 1, Little Bush Lane.

TANGYE BROTHERS AND HOLMAN,

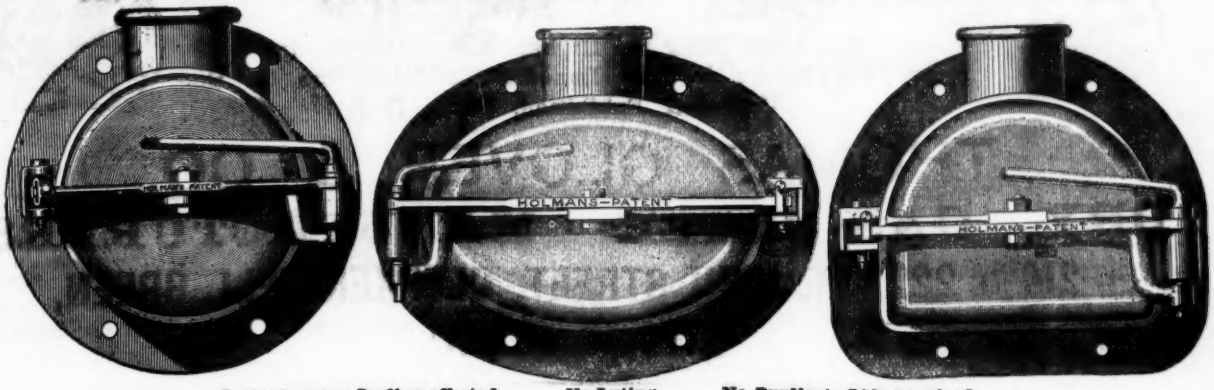
CORNWALL HOUSE, 35, QUEEN VICTORIA STREET, LONDON, E.C.,

(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

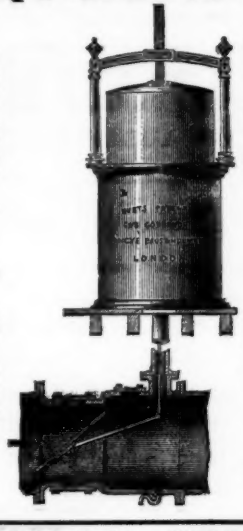
Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.



These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1878.

MESSRS. TANGYE BROTHERS AND HOLMAN.

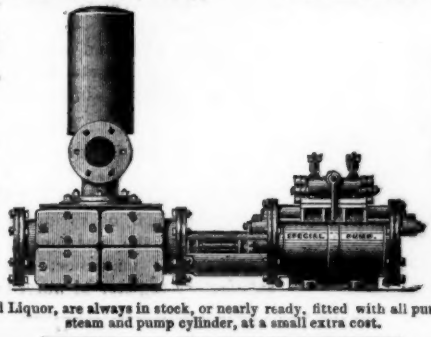
Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,
(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	21
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

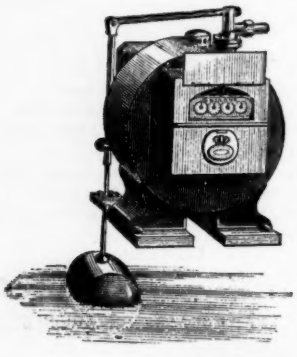
LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.

(ESTABLISHED 1816.)



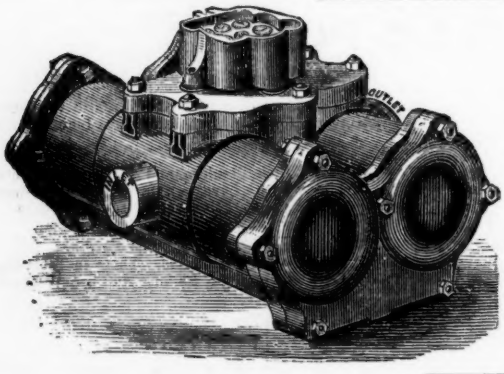
SOLE MAKERS OF THE LOW-PRESSURE WATER-METER.

This Meter will register with perfect accuracy, either at full speed, or with a few drops only passing through it.

It must be placed over the cistern to be supplied, and the water, after being measured, will fall from the outlet into the cistern below.

Each Meter is fitted with a ball-valve, so made that it can be adjusted to shut off the supply at the inlet when the water reaches any required height in the cistern.

The 100-gallon Meter is fitted with a cistern holding about three or four gallons, and may be fixed inside a house, free from the effects of frost, and requires no attention after once being fixed.



HIGH-PRESSURE WATER-METER.

The Union Water-Meter, of which an external view is here given, is of the positive class—*i.e.*, a Meter in which a measuring chamber is alternately filled and emptied, each filling being duly recorded. It is formed of two cylinders, with double pistons in each, having a rotary-valve of peculiar construction, which is worked from cams on the piston-rods.

It is claimed for this Meter, among its advantages over other Piston Meters in use, that it is extremely small and compact, and that its durability and accuracy have been proved by the fact that upwards of 20,000 of them, of various sizes, are in successful operation in the States. In England the instrument has been fully tested by several Water Engineers of eminence, and pronounced by them as a reliable and satisfactory register of water supply; it is also economical in cost.

ALL METERS are TESTED with 60 lbs. pressure before they are sent out.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 22, 1879.

Circular to Gas Companies.

THE Metropolitan Board of Works have, in compliance with the application of the French Société Générale d'Electricité, agreed to make a more extended trial of the electric light. It is proposed to have twenty more lights, some in Northumberland Avenue, if the consent of the Vestry of St. Martin's-in-the-Fields can be obtained, and some on Waterloo Bridge. The charge for the lamps, after the expiration of the present contract, is to be only threepence per hour per light. The French Society wished to have the experiment continued for twelve months; but the Board determined, at their meeting on Friday last, that a six months experiment would be sufficient for their purpose. The fall to threepence per hour per light is a considerable drop; but it will scarcely induce the Metropolitan Board to continue the experiment unless better results follow than have hitherto been obtained. We are not told for how many hours in the evening the light is to be used, nor how far it will require to be supplemented with gas. Hitherto, wherever the light has been applied, it has been extinguished early; and, for the illumination of the really dark hours, gas has always been employed. It says but little for the new light, that it cannot be made continuous; but if it could be, the expense, even at threepence per hour per light, would militate against its general employment.

Sanguine expectations are, however, now entertained that the electric light is the public light of the future. It seems that the twenty new lights which are to be installed by the Metropolitan Board will be actuated by the same 20-horse power engine as was employed for the original twenty lights, but with an enlarged Gramme machine. With this addition or substitution, very long circuits, it is alleged, may be maintained. Some, indeed, have an opinion that all the principal streets and open spaces in London may be illuminated by a common centre of force at Charing Cross. Others prudently recommend that several centres should be established. It is perhaps premature to express any opinion as to the complete success of this large extension of electric lighting until we have the results of the experiments about to be made by the Metropolitan Board. We have said all along that much, if not all, would depend on the relative cost of electricity and gas. An opinion seems to be gaining ground that, light for light, electricity may in a short time be able to hold its own against gas; but the fact has yet to be proved. We have at present no fear of witnessing gas superseded in London streets. It will not be until we have seen the electric light maintained in operation during all the hours requiring artificial lighting, that we shall have any apprehension of gas being supplanted in our thoroughfares. Supposing, however, such a result to happen, Gas Companies, as we have said before, have nothing to dread, and public lighting, we all know, brings an infinity of trouble and very little profit. Perhaps if all the streets of London were lighted by electricity, the Gas Companies would not regret the change. Their strongholds lie where electricity is not likely to penetrate for a very long time; and if they be only true to their own interests, the consumption of gas will go on increasing as fast as it has done during the last few years.

From New York we learn that Mr. Edison has, after all, not yet perfected his invention, or rather brought it into a condition for general use. He still finds platinum too dear for his purpose, and is now hunting all over the continent of America for new supplies of the metal. California will, of course, receive a large share of his attention, and by-and-by, some years hence, we may hear that the metal has been found in sufficient quantities to make its use in electric lighting remunerative.

The Liverpool Lighting Bill has passed a second reading in the House of Lords, and stood for Committee yesterday. Rather late in the day, the Gas and Water Companies Association issued a form of petition which Companies were recommended to sign and transmit forthwith for presentation. The Bill, as it left the Commons, gives the Corporation of Liverpool power to supply the new light to places of public resort, such as theatres, music-halls, &c., and to private establishments, such as railway stations, &c.; and it is against the granting of such powers that the Gas and Water Companies Association very properly protest. They further set forth in the petition that the Bill, as it now stands, will only confer power to make experiments with money which must, in the long run, come out of the pockets of the ratepayers. The Corporation of Liverpool have large private funds, but they do not propose to expend any of those in experimenting with the electric light. It is the ratepayer who is to pay for all, and he is forbidden to profit by it, while he will be required to make good any loss the Corporation may sustain in the course of their investigations and in their pretended endeavour to provide a better illuminant. The Bill is so far inimical to the interests of the Liverpool United Gas Company, that strenuous opposition will be made to prevent its further progress. More than this, if it be passed it will constitute a precedent of a most dangerous character. It will be the first time that a Corporation have been granted power to make experiments at the expense of the ratepayers, for the purpose of bringing to a successful issue a purely commercial undertaking. We regret that this petition was not circulated at an earlier date, and very extensively signed. Gas Companies have a special interest in endeavouring to restrain power being granted to Local Authorities to encroach on their rights and privileges.

[Since the above was in type, we have learnt that the Lords Committee passed the preamble of the Bill.]

It would appear that no alterations in the *locale* of the Metropolitan gas-testing stations, which would remove them beyond the distance from the works now prescribed by Act of Parliament, can be made without the authority of another Act; and therefore the Board of Trade have recommended that the Corporation of the City of London should confer with the Metropolitan Board of Works, and promote a Bill to which the Central Authority have promised to give their support. It is, of course, the thousand yards distance, prescribed by previous Acts, which stands in the way of any change of situation. We do not know how far the Gas Companies concerned will be inclined to give up the limit, which was established after long and careful investigation. It seems

certain that up to one thousand yards from the manufacturing station gas loses none of its illuminating power by travelling. Further experiments are required to determine to what extent gas is depreciated by passing over a longer course. It may be that, under ordinary circumstances and meteorological conditions, the light-giving power of gas is very little diminished when it passes through some miles of pipes; but it would be unjust to the Companies if the testing-stations were removed to a long distance from the works, before an extensive series of experiments have been made to settle the question. The argument that gas should be tested where it is consumed, however remote the limits may be from the works, is not worth much. If gas of full illuminating power is sent out, and tested at the thousand yards distance, that test is amply sufficient for all practical purposes. Supposing the Corporation and the Metropolitan Board should agree to promote a Bill, the Gas Companies must endeavour to obtain the insertion of some saving clauses, which will relieve them from forfeitures incurred after changes in the positions of the testing-stations.

We write this with Dr. Whitmore's Annual Report on the quality of the gas supplied to the parish of St. Marylebone before us. The Doctor's testing-place is much more than one thousand yards from the Fulham station, at which the gas he tests is made; yet we find him reporting that throughout the whole of last year the illuminating power of the gas was never below 16·26 candles, while it occasionally rose to as high as 17·40, the average for the year being 16·80. This fact will, no doubt, be quoted if such a Bill as suggested by the Board of Trade be brought in. Still, there is no reason why the Companies should not endeavour to retain the old limit of one thousand yards.

The gas accounts of the Oldham Corporation, kept in a very intelligible manner, show that the undertaking is a most profitable concern. The net gain during nine months ending March last, which is the period included in the return we publish, amounted to £23,109. It is not stated how this surplus is to be disposed of; but we may assume that it will be distributed between the capital account and the borough-fund, as in former years. The price of gas in Oldham is 4s. 2d. per thousand, with discounts according to consumption; but this charge must be considered too high when such large profits are made. The consumption of gas in Oldham does not increase. Recent times have certainly not been propitious, but perhaps the rate charged for gas has had something to do with preventing the extension of consumption in the houses of the operatives. Most of the decrease has, however, no doubt, resulted from the stoppage of mills in the town and district. The working returns are highly creditable to the management. Gas of 18·3-candle power has been supplied, while the Oldham Gas Act only requires 14-candle gas. The yield per ton of a mixture of common and poor cannel coal was 10,070 feet, while the unaccounted-for gas amounted to only 6·949 per cent.

The Town Council of Plymouth, in opposing the measure promoted by the Gas Company, have run up a little bill of nearly £700. A small part of this will have to be paid by East Stonehouse, but the bulk of the charge falls upon the ratepayers of Plymouth. We put these facts before our readers in order that the ratepayers may clearly understand what liabilities are incurred by Corporations when they oppose an innocent Bill promoted by a Gas Company. If the Town Council had met the Gas Company in a candid spirit, they might have obtained all they have now secured at a very small cost; but we are half afraid that the temptation of having a holiday in London, although nothing but out-of-pocket expenses were charged, proved too strong for those who had decided on opposing the measure.

Gas coal continues to be low in price in the Lancashire and Durham districts, and there seems to be a prospect that favourable contracts may be made to run over a considerable period. It is likely that the larger Gas Companies are provided for a year or more to come, but the present would appear to be a favourable time for entering into further contracts.

The cause of the rapid decay of gasholders in hot climates can hardly be said to have been settled by Mr. Monk in his paper, read before the meeting of the British Association of Gas Managers at Newcastle last month, and reported in another column, although he gave several suggestions, which, followed out, may lead to a clear explanation of the phenomenon. The combined effects of air and moisture are unquestionably the strongest provocatives of the oxidation of iron, and probably in most cases the decay of holders may be ascribed to this cause. How to prevent the decay is not so easily determined. The interior of a gasholder coated with magnetic oxide would probably resist the action of air and moisture; but no experience on this point has yet been gained. In the case quoted by Mr. Newbigging, we should be strongly inclined to question the quality of the iron. It is hardly correct to say that all qualities of iron oxidize with equal rapidity, for every day's experience shows that some decay much more rapidly than others. The direction in which we think managers should look for a preventive of this destructive action would be the discovery of some impervious material insoluble in water, with which they could coat the inside of the holders; for, whatever may be the origin of the decay, it is certain that it commences in the interior.

Among the papers left unread was one on the Albo-Carbon Light, by Mr. J. Douglas, late of Portsea. The writer speaks somewhat strongly in favour of carburetting gas by means of naphthaline. The apparatus used by the Albo-Carbon Light Company is simple and ingenious, and we need hardly say that the light produced is of a very agreeable quality. The advantage claimed for the new light is that a considerable quantity of gas is saved in the production of much brighter illumination. Many will agree with Mr. Carr that the employment of this form of carburetter must be inimical to the interests of gas manufacturers, but we do not think that any alarm on the point need be entertained. It is, we believe, an indisputable fact that every invention brought out to lessen the consumption of gas, by the use of some carburetting material, has, in the long run, extended the employment of our manufacture, and we have no fear that, except in large spaces, such as the Westminster Aquarium, in which a great number of lights are employed, any considerable difference will be found in the gas bills, even when naphthaline is used. We quite agree with Mr. Carr that it would be a much more simple plan of getting more light, to burn more gas; but it is of no use shutting our eyes to the fact that the public will fly to any invention which promises to reduce their gas bills.

Water and Sanitary Notes.

The last report of the Registrar-General shows that the health of the Metropolis, as revealed by the death-rate, continues to improve. In the week before last it only amounted to 17 per thousand, the lowest observed since September, 1876. This is highly encouraging, and it leads us to hope that a permanent diminution of the rate may be observed. It is a misfortune, however, that we have no returns of sickness, which might show us that diseases, like rheumatism, of a non-fatal character, have been very rife. Be that as it may, we rejoice over this low death-rate, and sincerely hope it may continue.

Dr. Frankland's report on the condition of the Metropolitan Water Supply during the month of June is not so satisfactory as could be wished; but, as we have said before, his reports are based upon an examination of the water supplied on one particular day, and therefore can, in no correct sense, be taken to represent the condition of the waters during the whole month. However, the reports must be accepted for what they are worth. We regret to mention that Dr. Frankland describes the water supplied by three of the Thames Companies as having been quite unfit for dietetic purposes, in consequence of excessive pollution by organic matter, and the presence of moving organisms; the latter being a sign of inefficient filtration. Two other Companies—the Chelsea and the Lambeth—taking their supply from the same source, are reported to have furnished water of a quality superior to that supplied by the New River and East London Companies. As a matter of course, the deep-well supplies continue to receive Dr. Frankland's unqualified approbation.

A variety of authorities report on the quality of the water supply of the Metropolis, and among these is Dr. Whitmore, the Medical Officer of the parish of St. Marylebone, in whose laboratory samples of the water supplied by the West Middlesex and Grand Junction Companies are made monthly. The conclusions arrived at by the analyst, after his twelve months examinations, are, that the waters as furnished by these Companies are of excellent quality, and he challenges objectors to the Thames as a source to show that the health of the inhabitants of the districts supplied by the Thames Companies is worse than that of those who partake of water drawn from a reputedly purer source. Sufficient attention has hardly been paid to this matter. Practically, we believe, it will be found that in crowded districts the rate of mortality is pretty much the same, whether the inhabitants get their supply, say, from the Southwark and Vauxhall Company, or the West Kent Company. Dr. Whitmore notices the fact to which we have often referred, that in the northern towns,

supplied with reputedly pure water, the death-rate is higher than in the Metropolis. The true reason for this is pointed out, when it is shown that the poorer part of the population live under worse conditions in Glasgow and Liverpool than they do in London. The case of another town might be mentioned which is supplied with pure spring water—we allude to Sunderland—where the death-rate is nevertheless higher than obtains here.

The Liverpool Town Council had another long discussion yesterday week as to the future water supply of the borough, on the bringing up of the report of the Water Committee substantially recommending the adoption of the Vyrnwy scheme. The motion for the adoption of the report was ably supported by Mr. E. J. H. Wilson and Mr. Bower, but the Haweswater scheme found favour in the eyes of some of the Council. One member spoke strongly in favour of sharing with Manchester in a supply from Thirlmere. In the end, the discussion was adjourned till the 28th, when it is to be hoped some decision will be arrived at. Before the discussion commenced, a report was read from Dr. Frankland, setting forth that the water of the Vyrnwy and that from Haweswater were equally good, but to make them entirely free from objection they should be filtered. Probably, in the end, the source decided upon will depend on the cost involved in the execution of the necessary works, as compared with that which would be required for the other schemes.

We have read with care the two papers to which the Council of the Society of Arts allotted silver medals, for the best suggestions for dividing England and Wales into districts, and for the supply of pure water to the towns and villages in each district. For one of these, that by Mr. J. Lucas, we can say but little. He simply maps out England and Wales into three divisions, to each of which he would assign a Chief Commissioner and two Sub-Commissioners, with fifty-one Watershed Boards for the whole. How extensive would be the duties of the Commissioners under this scheme may be guessed from the fact, that the southernmost district extends from the Wash to Land's End, including part of Somersetshire. The other two districts are more carefully laid out, and more amenable to superintendence; still there is a want of congruity in the scheme, and this will, we think, prevent the adoption of any part of it. It is all very well to suggest the appointment of Commissioners—nothing else would "go down" with the Society of Arts; but, even under this scheme, the work to be done would be left to the Watershed Boards, the constitution of which is somewhat remarkable. It is suggested that a Board should be formed of one-third life members, who are to be landed proprietors owning property to the rateable value of £300 per annum, and elective members, who must own property rated at the least at £100 per annum. We need hardly say much more for this scheme, which we do not think will meet with general approbation. It only touches the fringe of a great question. When we speak of mapping out England and Wales into watershed areas, we mean allotting to each town and village its natural supply.

Mr. F. Toplis has done a good deal better in his paper. He proposes to divide England and Wales into twelve districts, each of which shall be provided with a body of Commissioners appointed by the Crown, but not connected with the district. These Commissioners are to be assisted by competent legal and engineering advisers. The Commissioners, under a proposed new enactment, are to take over all water undertakings in the hands of Corporate bodies and Local Authorities. Water Companies are not to be acquired unless the supply be deemed unsatisfactory. It is proposed that a new Central Authority—that is to say, that a Public Health Department shall be constituted, under which the whole of the Commissioners will Act. For the rest, Mr. Toplis gives an excellent geological and meteorological account of the surface of England and Wales, with a description of the derivation of most of our large supplies. The essay contains many useful suggestions, which, if ever the question of National Water Supply should be entertained, will be found of the utmost value.

The Indemnity Bill of the Metropolitan Board of Works hangs fire, and, considering the state of public business, stands a chance of being lost for the present session. It is always down on the paper, but with such a number of Government notices before it, that it is never reached. It does not, of course, matter to the Metropolitan Board whether they get the Bill this or next session. They have paid the money, and can afford to wait for the relief, which is tolerably certain to come.

Meanwhile another Board are likely to become a candidate for an Indemnity Bill. The Lower Thames Valley Main Sewerage Board, in the preparation and promotion of the Bill which was so summarily rejected by the House of Commons, laid out £6730—an expenditure which it now appears was illegal. We mentioned a fortnight ago that a section of the ratepayers, within the district of the Board, had been advised to apply to the Master of the Rolls for an injunction restraining the Board from paying the money out of the rates which they have power to levy. The application was heard on Friday last, and the injunction was promptly granted by his lordship, whose opinion appears to be that a Board brought into existence to do certain work, have no authority to expend money in the promotion of a Bill which for their purpose was quite unnecessary. It seems clear that, in the present case, the proper course for the Board to have taken would have been to apply to the Local Government Board, under whose auspices they were constituted, for power to raise money to carry out any scheme to which the Central Authority might give their sanction after inquiry. The Sewerage Board were, however, ambitious, and sought to set aside the action of the Central Authority by obtaining an Act themselves. The attempt has failed, and it remains to be seen who will have to pay the costs incurred. Probably, as intimated above, recourse may be had to an Indemnity Bill, which doubtless the somewhat merciless opponents of the Board in the House of Commons will reject with as much promptitude as they did the Bill which has brought the Board into all this trouble.

What museum will be next instituted it is impossible to say, but an exhibition is to be opened at the Alexandra Palace, to be called the "National Water Supply Museum." The scope proposed for this exhibition is a rather wide one. It is to be divided into fifteen sections, and will embrace, we are bound to say, exhibits of all that can be considered of interest in relation to water supply—that is, if the Committee can get them. Of course, there are a large number of people, with occupations bringing them little or no profit, who can afford the time to devote themselves to displays of this kind. There are, too, projectors who have been for years before the world with schemes which nobody will adopt, but who still look hopefully to the Society of Arts to make their fortunes. There is likewise a large number of ambitious manufacturers and tradesmen, who, while protesting that they always lose money by exhibitions, are nevertheless found to be wherever a display is opened. Of course, the managers of not too profitable edifices are glad to get anything they can to place within their scantily-occupied spaces. We shall be curious to see what this exhibition at the Alexandra Palace will bring out.

The necessity for an Act to prevent the pollution of rivers is well shown in what we fear must be called an accident which happened to the River Dee last week. The storm waters last Sunday week caused a brook, which drains several lime and lead works, to overflow, and the consequence was the poisoning of an enormous number of fish in the River Dee. Under the proper supervision of a Conservancy Board, care would have been taken to prevent any catastrophe of this kind, which could be easily avoided by the exercise of a little engineering skill.

Truth to say, the Artizans Dwellings Act is not working well for the Metropolitan ratepayers. Various plots of land have been cleared of the foul slums which existed upon them, and now that the vacant spaces are required to be filled up with a new and better class of buildings, the true value of the land on which the condemned tenements were situated is revealed. Of course, these tenements had a value in themselves, and the owners of them, who drew heavy rents from their wretched tenants, naturally stood out for the real commercial value of their property. To take two instances: The Metropolitan Board of Works bought some property in Drury Lane, at the rate of £113,000 per acre; they are now selling the land at £10,000 per acre, involving a loss to the ratepayers of £336,000. In Whitechapel some property was bought, which, now the ground is cleared and is being re-sold, will produce a loss of £600,000. We are bound to say that we did not expect these results. They seem to show that something is wanted in our municipal arrangements, which would prevent these enormous losses. How do the Corporations of Liverpool and Birmingham manage when they clear ground for public improvements?

The so-called disinfectants now before the public have, for the most part, this in common—they are poisonous, and hence repeated accidents, which, mainly by the carelessness of those who ought to have known better, have resulted in the deaths of children and ignorant adults. Granted that a new and harmless disinfectant is required, we do not know of anything better than an article called "Sanitas." This preparation is made by driving a stream of air through a mixture of

turpentine and water, by which the former becomes partly oxidized or resinified, while the half atom of oxygen disengaged, dissolves in the water, in combination with the hydrogen liberated at the same time, to form a solution of peroxide of hydrogen, which is known to be one of the strongest disinfecting agents we have, and no doubt when "Sanitas" is first prepared, its efficiency as an oxidizer is very pronounced. This substance has been, for the last year or two, brought into prominent notice, and its merits are well worthy of investigation. The Company who now work the patent of Messrs. Kingzett and Zingler have set up extensive works at Bethnal Green, in which they produce the new disinfectant in very large quantities. The air is forced through the mixture above mentioned for three hundred hours, and the plant is so capacious that at the end of that time one thousand gallons of "Sanitas" are produced. The resinified turpentine, when separated from the watery solution of peroxide of hydrogen, is still credited with sanitary qualities, and is made into soap, which has excellent detergent properties. There is a large field for a good disinfectant, and "Sanitas" will, no doubt, have its share of patronage.

GAS APPARATUS AT THE ROYAL AGRICULTURAL SOCIETY'S INTERNATIONAL EXHIBITION.

SECOND NOTICE.

Next to the gas-engines, in point of interest to those who advocate the extended use of gas, come the steam-boilers which are designed to use gas as fuel. There were several of these shown by different exhibitors, yet this branch of gas development was not so well represented as it might have been. Although the nature of things forbids the attainment of such a high duty from a given quantity of gas by this method as from an equal quantity consumed by a direct gas-engine, still there are simple but powerful reasons in favour of the indirect and generally more costly gas-heated boiler. Chief among these is the fact that, compared with steam-engines, gas-motors are as things of yesterday, and a knowledge of their construction has not yet reached the great majority of engine-fitters and handy men throughout the country, most of whom are able to do small repairs to any ordinary steam-engine, and there is no doubt that the fear of having to send a machine to the maker in the case of a break-down, deters many otherwise willing purchasers in small or inaccessible towns. Here it is that a gas-heated boiler, which without sacrificing the simplicity of the steam-engine, offers the advantages of not requiring stoking, with regular steaming, cleanliness, and absence of smoke, would frequently find favour, despite its increased cost, which, after all, would still be covered by the saving in labour. It can scarcely be said that much progress has yet been made in this line. There is still too great adherence to the general idea of the forms associated with the use of solid fuel. It will be a considerable time before boiler-makers will be able to divest their minds of the memories of large flues and a heating agency of great bulk, and confine their designs strictly to the problem of making the most of a flame of comparatively small size, intensely hot, but deficient in radiating power, such as that of the Bunsen burner and its modifications.

Messrs. Blake and Co., of Manchester, had a 2-horse power gas-heated boiler, which was also capable of burning solid fuels; and the General Engine and Boiler Company, of 8, Union Court, Old Broad Street, E.C., had two engines, of 1-horse power and ½-horse power each, fitted with gas-heated boilers. Mr. E. S. Hindley, of Bourton, Dorset, showed a very neat little 1-horse power engine and gas-boiler.

Messrs. Thomson, Sterne, and Co., Limited, of the Crown Iron-Works, Glasgow, showed a gas-heated boiler of a somewhat singular kind. This was in connection with an implement which was styled a domestic motor of 1-10th-horse power. In this little machine, which was nothing more nor less than a miniature steam-engine of peculiar design, the steam was generated in a small pipe which passed through a flame of gas, and the water was pumped through this "boiler of forced circulation" by the engine itself. Appliances were so arranged that there was no danger of explosion, and it was claimed by the manufacturers that a distinct want was thus supplied by the introduction of a handy source of small power for driving sewing-machines, knife-polishers, amateurs lathes, &c. Of course, in arrangements of this kind there is no attempt at economy of fuel, which, although necessarily consumed in a high ratio, considering the duty actually performed, is cheaper than manual labour. The same firm also showed an ingenious piece of mechanism, the Hydrocarbon Motor, which, if we mistake not, is an American invention, and was introduced to the European public at the Paris Exhibition. The power is derived from the expansion of the products of combustion of mineral oil within the cylinder, the necessary arrangements and appliances for maintaining this action being very curious and beautiful. The example shown was 5-horse power, and consumed one gallon of oil per hour, thus taking one-fifth of a gallon per horse power per hour. The machine altogether, appearing, as it did, refulgent with nickel plating, and with all its cranks and rods and pumps going with ease and precision, was more like a specimen of elaborate clockwork than a motor for this work-a-day world. It was a machine which few visitors to that part of the yard could fail to notice, for it arrested general attention in a rather original way, and probably most of the people who inspected it had discovered its whereabouts *by following their noses.*

Gas-stoves for cooking and heating were represented in only two stands, and of these the display made by Mr. T. G. Potter, of 17, Oxford Street, W., was confined to four examples of Williamson's manufacture which call for no special remark. Messrs. Billing and Co., of Smart's Buildings, Bloomsbury, W.C., and 90, Hatton Garden, E.C., showed a good collection of 72 stoves of various kinds, which well maintained the reputation of the firm for careful workmanship. There were no particular novelties among the exhibits, but it was satisfactory to see that the firm were alive to the desirability of giving the greatest possible amount of accommodation without sacrificing finish, in stoves intended for small families where probably no servant is kept, and where the convenience of gas is as powerful a recommendation as any anticipated economy. It is among this class of consumers that gas-stoves ought to make great way; but there is danger lest buyers should be attracted by cheap articles, which might, by failure, cause disgust. Messrs. Sidney Leoni and Co., of 74, Strand, W.C., who were down in the catalogue for a great display, were, on the ground, conspicuous by their absence. It was unfortunate that none of the French manufacturers of gas-stoves were represented, as the comparison of their renowned goods with those of the best English makers would have been instructive.

Useful in hotels, &c., would be the gas calender of Messrs. Thomas and Taylor, of Stockport and Salford, by which one person can calender the largest table-cloth without assistance. It is probable that there would be found a considerable field for gas calenders for domestic purposes, if the matter were taken up and properly pushed by a few enterprising firms.

Although the list of gas-consuming apparatus was not particularly long, there were shown a great many implements and appliances of interest to manufacturers of gas. The stands of steam and general machinery, in action and otherwise, which could be said to appeal to gas engineers as much as to any other factory managers or users of power, were, as might have been expected, numerous and important. Boilers of every type, engines in endless variety, and pumps enough to have sensibly lowered the Thames, were to be seen ranged in lines that might have been measured by miles.

Messrs. Gwynne, of Hammersmith, had a fine show of their well-known centrifugal pumps, which were pouring cascades of dirty water into an extemporized reservoir in a style which evidently aroused in the spectators a desire to see them employed in draining the Show Yard. The air-exhauster which this firm now fit to their centrifugal pumps, with the view of obviating the troublesome process of charging the pump, is a very neat arrangement, the value of which will doubtless be fully appreciated by any one who has ever sunk a draining well with the old pattern pumps. A portable centrifugal pumping-engine and boiler, with suction and delivery pipes made to swivel to any angle required, was a conspicuous article in their stand.

Messrs. G. Waller and Co., of Holland Street, Southwark, had several of their compact and well-finished manufactures on view, ranging from engines and gas-exhausters through various departments of utility in water and sewage or drainage works, although they did not send such a collection of articles germane to gas-works as they might have done, if the general scope of the exhibition had been more favourable for their display.

Messrs. Tangye Brothers and Holman, of 35, Queen Victoria Street, E.C., had a very extensive stand, filled principally with examples of this firm's well-known types of steam-engines, than which none are stronger or steadier, and with their "Special" direct-acting pumps, description of which is superfluous. Quite a new departure for this firm are the centrifugal pumps of their manufacture which were exhibited. They had an arrangement whereby either the disc or spindle could be removed without disturbing the pipe-connections. Several hydraulic lifting-jacks, similar to those by the aid of which Cleopatra's Needle was raised, were also shown.

The Savile Street Foundry Company, of Sheffield, were well represented. We may mention particularly the new blower and gas exhauster made by this firm, as a promising apparatus deserving careful attention.

Messrs. Hayward Tyler and Co., of Whitecross Street, E.C., were well represented by a list of 55 entries. The curious hot-air engines, Rider's patent, which are manufactured by this firm, were shown by three examples. One in action was worked by gas, but it does not appear likely that such a method of working would be very economical. The "Universal" direct-acting steam-pumps, of which there was a good show, attracted considerable attention. There is no doubt that as this type of pump becomes generally known it will be preferred for most purposes to the more cumbrous barrel and crank pumps.

A great show was made by the Pulsometer Engineering Company, of 61 and 63, Queen Victoria Street, E.C., who showed 19 pulsometer steam-pumps, besides other articles. These machines may certainly claim to be the most direct-acting pumps in existence, and with fewest working parts, save only Giffard's and similar injectors. The valves are made in various patterns for special purposes. For excavators use, this pump has met with considerable favour, from its simplicity and freedom from liability to get out of order. The Hydrotrophe (boiler feeder), which is a lineal descendant of the pulsometer, was also exhibited. It was claimed for this little apparatus that it could be regulated for continuous or intermittent feed, and required no attention. This firm also showed a rotary cleansing water filter, for cleansing large quantities of water for boilers, &c.

The "Comet" pump was exhibited by Messrs. Bartrum and Powell, of 35, Queen Victoria Street, E.C., and is claimed to be very reliable, especially for slow speeds. In appearance it is somewhat similar to Beale's exhauster, but in the present case the slide is fixed to the

bottom, and the eccentric drum on the shaft moves around the inner surface of the case.

Messrs. Joseph Evans and Sons, of Culwell Foundry, Wolverhampton, showed a combined pump, termed the "Reliable," specially designed for pumping tar and other thick liquids, the valves being mechanically actuated. A particular feature in it was the reversing gear, by which a back current through the pump could be set up at any moment, with the view of clearing an obstruction from the valves or suction-pipe.

Messrs. Schäffer and Budenberg, of Manchester, had a modest stand of really valuable articles. Besides their well-known steam, vacuum, and hydraulic gauges, and the strangely-shaped "Buss" governors, and numerous other engine and boiler mountings, they showed an ingenious invention—Royle's patent swivel union for gas, water, or steam pipes. By means of a diagonal bolt and ground joint, the same fitting was adaptable either as a straight, elbow, or skew union at any angle; and by adhering to a uniform size of bolt and nut, one spanner is rendered available for all-sized unions. The chief drawback to these appliances would appear to consist in the bolt, which crosses the bore, and might prove an obstruction.

In various parts of the ground there were a number of appliances in connection with domestic water supply; but the important branch of waste-preventing apparatus was but sparsely represented. Messrs. Voice, Godfrey, and Co., of Broad Street, Bloomsbury, had several varieties of their new "Hydrostatic" valves, and a water meter designed on the principle of the hydrostatic paradox. Messrs. A. Barr and Co., of Anderston, Glasgow, showed a compact and strongly-made water-pressure engine, in several sizes, which are better known and appreciated in Scotland than farther south. Where water in bulk can be bought cheap, as in Glasgow, the simplicity of these machines would lead to their frequent use. With the pressure of 90 feet head, which was available in the yard, it was a pity that one of the engines was not shown in action.

Messrs. F. H. Atkins and Co., of 62, Fleet Street, E.C., the well-known makers of domestic filters in infinite variety, exhibited a novel water softening and purifying apparatus, which was calculated to extend the benefit of Clark's process to small, or rather private requirements. It was ingeniously constructed to ensure a regular admixture of lime solution to the water-cistern, and the strainer could be readily cleansed of the precipitate, which, with the calcareous matters, also eliminated the noxious impurities which the water might previously have contained. A filter appended to the outlet completed the process, and the purified water was wonderfully soft and limpid. We do not hear so much now-a-days of the evil effects of hard water, but, for all that, a soft smooth water is a great luxury for external use, and this neat arrangement is well adapted for procuring it where otherwise unattainable.

In conclusion, the exhibits of the so-called portable gas-making machines of Mr. H. L. Müller, of Birmingham, and the Sun Auto-Pneumatic Lighting and Heating Company, of Southwark Street, S.E., which produce a lighting medium by passing air over volatile hydrocarbons without heat, and that of Mr. F. W. Clark, of Great Queen Street, W.C., who heats his material, were noticeable, as testifying to the popular appreciation of the convenience of gas lighting, and the consequent desire to obtain it even where coal gas is not obtainable. We may also mention the exhibit by Mr. J. C. R. Okes, of 39, Queen Victoria Street, E.C., of an assortment of "Victoria" leather belting. It was of English make, and certainly, if we might judge by appearances, was some of the best we have ever seen.

THE LAW OF RATING.*

The system of rating property for the maintenance or relief of the poor, is of universal application in this country; yet notwithstanding that the incidence of local taxation affects so many of the population, the principle upon which taxes are levied and raised is understood by but few. The majority of people contribute their quota to the fund, viewing it as an inevitable burden, from which there is no possible escape, and satisfied with a periodical grumble when the tax-gatherer pays his accustomed visit.

The subject of rating, it must be admitted, has but few attractions to the average citizen, couched as it must necessarily be in dry technical phraseology, and brimful of the decisions of judges learned in the law. In these respects it is, perhaps, no less picturesque than other subjects of a legal character; but, as a matter of profit, its outcome is less positive than negative, and its parochial associations also tend to surround it with the vulgar aroma of beadledom.

And yet the history of rating is far from being uninteresting reading. In the skilful hands of Mr. Castle, in his Treatise on the Law of Rating, it is invested with much of the air of romance. The introduction to the work is replete with lore that is precious, not only to the antiquary, but to the student of history, and no such student can be said to have grasped the full knowledge of the past events of his country until, along with his other studies, he has made himself acquainted with the early history of the subject under consideration.

In the lucid, and perhaps somewhat brief introduction referred to, Mr. Castle gives an interesting account of the origin of the relief system, which, at first, down to the time of Elizabeth was voluntary in character, the people being requested or appealed to by the "parson" to contribute, according to their means, to the sustenance of the poor. Personal or individual almsgiving, as opposed to parochial charity, was at this early time, as very often it deserves to be at present, discouraged and condemned; and, as though a simple discountenancing of indiscriminate charity were not enough, it was treated almost as a criminal offence, and punished with fines and amercements.

The statute 43 Eliz., c. 2, though not the origin of the system of relief, is the basis upon which our present method of assessment rests. This Act was the culmination of a long series of legislative enactments that had their origin, so far as law is concerned, in pre-historic times.

It is true that the Act of Elizabeth refers to personal as well as to real property, "but," quoting Mr. Castle's words, "owing, perhaps, to the difficulty of assessing personal property, and, perhaps, to the modern principle of throwing all burdens upon land, a custom sprang up in many parishes of not assessing this property; and, at the present time, all personal property is declared by statute to be not rateable; otherwise the Act of Elizabeth remains untouched in principle to the present time."

From the earliest times of which we have record, it has been endeavoured to discriminate between the actual poor whose unfortunate condition entitled them to relief, and the sturdy vagrant who endeavoured to secure it under false pretences, but who, in so doing, subjected himself to the severest penalties, such as, in the present more enlightened and more merciful days, would be considered as cruel as they were undeterrent in their effects. It is a curious circumstance, about which much might be said, that exaggerated penalties or punishments have invariably failed of their object, probably by inducing a reckless spirit in those subject to their influence. Again quoting from Mr. Castle's work, "To sum up the history of these statutes, we find that, from the earliest period, the right of the poor to parochial relief has always been admitted; but that the Legislature rested content with declaring this to be the law, directing its earlier efforts, not to the support of poverty, but to its suppression, and going so far as to punish vagrancy with whipping, the stocks, branding, slavery, and even death. Gradually, however, the real difficulty became apparent, and it was discovered to be quite as important to find food and work for the poor in their parish as it was considered to be to force the destitute by all means to return there. The Legislature, having this former object in view, for some time attempted to carry it out by appealing to the charity of the parishioners, by instituting collections for the poor, and arming them with such power as religious and moral influence could give; but these in their turn being found ineffectual, authority was given to the civil powers to make an order upon the person contumaciously refusing to contribute. The next step was then taken, and a general assessment to the relief of the poor was instituted by the Act of Elizabeth. All legislation ceased there; for at the very session of Parliament at which it was passed, the first growl of the coming storm was heard, and the first spark of that spirit which was afterwards to light up a civil war, flashed forth. Elizabeth, as Hallam tells us, retired from the struggle, and when the Commons resented her interference in a Money Bill, she declined the contest. James I., as we know, struggled through his reign the best way he could with what money he could get. Being the English Solomon, he was prepared to, and always did argue the point with such of his commoners as would listen to him; but his pugnacity went no further. Charles succeeded, and we know with what result. Of course, while John Hampden was stirring up all England on the question whether he was liable to contribute to the Royal Exchequer 20s. for ship-money, there was very little attention paid to the wants of the pauper, whether a sturdy, valiant beggar, or one really destitute. All further legislation was arrested, and such as it was it remained; and on this Act our system of parochial relief has been built—a system with which no Government has been bold enough to interfere."

The two leading questions treated of in the work before us are—first, In respect of what description of property a person is liable to be assessed; and, second, Upon what principles a person who is liable should be assessed. The first has to do with the question of *liability*, the second with that of *quantum*. In dealing with these separate divisions of the subject, the book is divided into two parts, subdivided into nine and seven chapters respectively, and the treatment of both, as might be expected from the author, with his large experience in matters of this description, is of the most thorough and painstaking kind.

In respect of both questions it is an indispensable condition that, in order to render a person liable to be rated to the relief of the poor, he must be the occupier of real property yielding, or capable of yielding a net annual value; that is to say, "a clear rent over and above the probable average annual cost of the repairs, insurances, and other expenses, if any, necessary to maintain the property in a state to command such rent." This is, in brief, the gist of the whole matter, and the principle thus laid down, worked out to its legitimate conclusion, fixes the amount of the assessment on which the rate is calculated in every example of parochial rating in this country. But although the principle of rating can be thus stated in language which is axiomatic in its directness and brevity, when it comes to receive practical application there is room for almost interminable argument, not so much on what constitutes the net annual value of any special property, as on the method of ascertaining or fixing its amount.

It is just here where a work of the kind under review comes to our assistance, and in reading, in the succinct form here given, the ruling of the judges in the numerous cases that have come before the courts for decision, it is not difficult to arrive at a definite conclusion on the bearings of each particular class of assessments. In Mr. Castle's treatise, all the most important decisions are given at length, and his comments in elucidation and expansion of the legal judgments,

* A Practical Treatise on the Law of Rating. By Edward James Castle, of the Inner Temple, Barrister-at-Law. London: Stevens and Sons. 1879.

and upon their application to the general subject, are of the utmost importance and value.

It should be noted that the term "real," as applied to property subject to rating, has a wider significance than is attached to it under other circumstances, as it includes not only freehold land and buildings, but also such as are of copyhold and leasehold tenure, with the "visible property," other than buildings, erected thereon, or appurtenant thereto.

The Act of Elizabeth, as already stated, includes personal as well as real property in its provisions, and this was originally rated equally with the other; but, owing to the difficulty, and, indeed, the impossibility of assessing property of this character in anything like an equitable manner, the custom gradually spread of overlooking it altogether; and in the present reign it has been declared exempt by statute. There are other special exemptions by statute of property which, under the Act of Elizabeth, would be subject to assessment, such as turnpike tolls, churches and chapels, literary and scientific societies, lunatic asylums, Sunday and ragged schools, corporation property, &c.; and, again, by custom, property in the occupation of the Crown has always been held exempt from rating. There are, however, various conditions under which even the foregoing are liable to be rated, such as when a profit is derived by letting the premises or a portion of them, and under other circumstances, which need not be enumerated here.

It has always been the practice not to rate empty houses or other premises, and although the question has never come directly before the courts, yet the practice in this respect is established by invariable usage. But a house kept furnished ready to be let as a furnished house, or a mill kept full of machinery and intended to be worked on a return of satisfactory trade, is rateable though unlet; the premises in such cases being considered to be used as a store-room for the time being, and therefore in profitable occupation.

On the latter point Mr. Castle remarks: "It is difficult to see why an idle mill should be taken to be a warehouse of the machinery that is a part of itself, any more than a house to let should be taken to be the warehouse of the doors, flooring, paper, ornamental mouldings, and the paint and varnish, all of which would suffer if the premises were not kept closed and some care taken of them. If an empty house is not to be considered as of value to the owner as providing a warehouse for his fixtures, and a protection to his property from the weather, why should a mill?"

We apprehend, however, that the term "machinery" would not be held to include the engines and gearing employed to drive the actual machines used in the manufacturing processes; these are properly fixtures, liable to be demised to a tenant from year to year, and therefore, like the doors, flooring, paper, &c., in an empty house, not subject to assessment except when tenanted.

Mr. Castle deals with the general question of rating, and consequently he has not much to say on the special subject of the rating of gas-works, not more, indeed, than four pages out of 520 being devoted to them. The principle laid down, however, will enable readers to work out for themselves the details required to find the net annual value, which represents the sum of the assessment.

The subject of rating is an important one to gas proprietors, and those in charge of the conduct of gas-works generally, because, like all other fixed property, these are valued in order to be rated to the relief of the poor, and for other purposes, in every instance throughout the country, and consequently it is a matter of concern for gas authorities to know that the rateable value of their respective properties is not assessed at an exorbitant and mistaken amount.

There is naturally a tendency on the part of parochial authorities and assessment committees to make the most of a gas undertaking, as well as other large works of a public character whereby profits are earned, and so to fix the rateable value as high as possible. In many instances that might be named, this policy has been carried out to such a degree that gas companies and gas undertakings belonging to local bodies have suffered from the injustice, and have successfully appealed against the impost, whereby the amount of the assessment, and consequently the rate, has been materially reduced.

Under these circumstances, whilst we are dealing with the question, it may be advisable to give a succinct outline of the recognized method of arriving at the value of such undertakings for the purpose of assessment, as followed by the leading authorities on the subject.

In doing this we may repeat what we have already stated, that it is laid down by the Legislature that all rating shall be on rent, and not on profits. The first Act relating to the subject, as we have shown, is contained in the statute of Elizabeth, and in order to obviate the difficulties that frequently arose, an Act was passed in the year 1836, called the "Parochial Assessments Act," which pointed out the principle upon which rating should proceed; that it was to be "upon an estimate of the net annual value of the several hereditaments rated thereunto—viz., of the rent at which the same might reasonably be expected to let from year to year."

Now, in the instance of large public enterprises, as railways, waterworks, and gas-works, the owner is generally also the occupier or tenant, so that no rent is actually paid. Therefore, to comply with the provisions of the statute, a hypothetical or imaginary tenant is introduced.

"Trade profits, unlike stock-in-trade, never were rateable *per se*, even where personal property was rated. But, in the valuation of property its capability for earning profits of trade is an element of value that can never be entirely eliminated" (p. 227). Applying this view to gas-works, it would appear to be a necessity, in order to ascertain the net annual value of the works and plant, and therefore the assessment, to take the gross earnings of the undertaking, and make the necessary deductions therefrom.

In one of the earlier cases that came before the courts—viz., *Rex v. The Birmingham Gaslight and Coke Company*, judgment was given by Chief Justice Abbott, who said: "The question proposed to us is not whether the Company be rateable for their buildings above ground, or their pipes under ground, but to what amount they are rateable. I am of opinion that the amount in respect of which they are rateable is the sum for which the buildings, tanks, and pipes would let to a person who is willing to carry on the business there. It appears from the statement in the case, that the premises, tanks, and pipes, if rated to the poor as other lands in the parish—that is, if the profits arising from the sale of gas are not included—are worth £200 per annum; but if the profits are included, then they are worth £800 per annum. I am of opinion that the profits are not in this case rateable. If they were, a blacksmith's forge might be rated, not at what it would let for, but at the sum which the blacksmith acquired by it." And Justice Bayley said: "I am of opinion that the Company ought to be assessed, not at a sum equal to the annual profits of their trade, but at that sum which the buildings, tanks, and pipes would produce to them, if let at an annual rent to persons willing to carry on the trade, or that rent which the Company would be forced to pay if the premises were not their own property." (Cited pp. 250, 251.)

This decision was favourable to the principle of ascertaining the letting value of the works *irrespective of the receipts of the particular occupier*, as is the case in other manufactures. On the face of it, however, it would also appear that the issue involved was as to whether the assessment should be a "sum equal to the annual profits of the trade." This is clear from the remarks of Justice Bayley, for his judgment is entirely in accord with the more recent decisions, as, for instance, in the case of *The Queen v. The Sheffield United Gas Company*, where Justice Blackburn, in giving judgment, and speaking of the distribution of the total rateable value amongst several parishes, says: "As to the first point—namely, the mode in which the respondents have arrived at the value of the entire subject, it seems to us that if the proper allowance for expenses and for tenant's profits and interest on capital has been made, and the proper value is put upon the stations, works, and buildings, &c., a proper mode has been adopted for obtaining the rateable value of the remaining property." (Cited p. 252.)

Admitting that it is just to introduce the hypothetical tenant, it seems to us simply impossible to arrive at the sum for which the buildings, apparatus, and pipes would let, from year to year, to a person willing to carry on the business, unless the accounts are fairly analyzed in order to ascertain the sum of the profits; for, unquestionably, the amount of the annual rent which an imaginary tenant would pay for a gas-works would be regulated entirely by the profits likely to be earned. It is a mistake to assume that because profits are taken into account in fixing the annual value, therefore profits are rated. The fact is, that before the landlord's rent can be found, a reasonable allowance for tenant's profits must be deducted. Of course, it is always open to argument whether the rate of percentage taken as profit is sufficient; but any difference of opinion that might arise on this head in no way affects the general principle. The judges in all the latest decisions have taken this view, which is the only logical one, though the effect, we are bound to admit, has been to increase the assessments.

In order, therefore, to ascertain at what rent such a tenant as we have supposed might reasonably be expected to lease the works, it is necessary, first, to find the amount of the gross annual income; then, the gross expenses of the year consequent upon its working. The one deducted from the other gives the net annual receipts.

The next point to be determined is the occupier's share of these net receipts. This is done, first, by fixing the sum of the capital required to work the undertaking, which is usually taken at half the gross expenses. Then the value of the chattels and stock-in-trade is ascertained; in these are included the meters, the retorts, and the coal in stock. These added together give the amount of the working capital.

On the amount of capital thus ascertained, interest at the rate of 5 per cent. is reckoned; then 10 per cent. as trade profits, and 2½ per cent. for casualties, making together 17½ per cent. This rate of interest calculated on the tenant's capital gives the tenant's share of the receipts, which, deducted from the full amount, leaves the gross estimated rental.

Then come certain statutable deductions, consisting of an allowance for insurance, and for the renewal of buildings, apparatus, and mains, and the sum of these deducted from the gross estimated rental gives the net rateable value.

An apportionment of this amount has then to be made, first of a sum representing the rateable value of the works only, which, as a general rule, may be taken as varying from two-thirds down to an amount slightly in excess of the value of the distributory plant. And, finally, when the mains of a company ramify into a number of parishes, as is frequently the case, the value of these is apportioned amongst the different parishes according to the value of the mains in each parish, or, as is sometimes done, according to the rental derived from each.

Such, in general outline, is the course pursued in settling the amount of the assessment of a gas undertaking, and it will be evident that in arriving at the proper sum there is scope for the exercise of both judgment and skill.

Returning from this digression to the work under review, we have no hesitation in expressing our admiration at the able manner in which the author has treated a difficult subject, and in recommending it to our readers, who will be amply repaid in the amount of information they will glean from a careful perusal of its pages.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JULY 14.

Knutsford Light and Water Bill.—The Select Committee reported that no parties had appeared in opposition to the Bill.

Rotherham Borough Bill,—read the third time, with the amendments, and passed.

Liverpool Lighting Bill,—read a second time.

TUESDAY, JULY 15.

Liverpool Lighting Bill,—committed.

Alliance and Dublin Consumers Gas Bill,—reported, with amendments.

Petitions against the Liverpool Lighting Bill were presented from (1) Liverpool United Gaslight Company, (2) Manufacturers of gas-meters, fittings, &c.

THURSDAY, JULY 17.

Nottingham Corporation Bill,—reported, with amendments.

Over Darwen Corporation Bill,—read the third time, with the amendments; further amendments made, and Bill passed.

The Liverpool Lighting Bill was referred to a Select Committee, consisting of Earl Spencer (Chairman), Earl Dundonald, Lord Somerton, Lord Waveney, and Lord Norton; to meet on Monday, July 21.

FRIDAY, JULY 18.

Alliance and Dublin Consumers Gas Bill,—read the third time, with the amendments, and passed.

HOUSE OF COMMONS.

MONDAY, JULY 14.

Petitions against the Metropolitan Board of Works (Water Expenses) Bill were presented from (1) London, (2) United Wards Club, (3) City of London.

HOUSE OF LORDS COMMITTEES.

WEDNESDAY, JUNE 25.

(*Before Earl* DUCIE, *Chairman; Earl* DARTREY, *Lord* ZOUCH OF HARYNGWORTH, *Lord* ORANMORE AND BROWN, *and Lord* GORMANSTON.)

BIRMINGHAM GAS BILL.

Mr. O'HARA, Mr. CLIFFORD, and Mr. KNOTT appeared for the promoters; Sir EDMUND BECKETT, Q.C., and Mr. MICHAEL, Q.C., for the Corporation of Birmingham, petitioners against the Bill.

Mr. O'HARA, in opening the case for the promoters, said the object of the Bill was to amend the Birmingham Corporation Gas Act of 1875, with respect to the supply of gas to Northfield and Yardley. Previous to that Act being obtained, there were two Companies supplying gas in Birmingham, one of them being the Birmingham and Staffordshire Gaslight Company, which was incorporated by Act of Parliament in 1825. That Act was amended by a subsequent one, passed in 1845, which extended the limits within which the Company were empowered to supply gas to a place called King's Norton. No further alteration was made until 1858, when the Company were again in Parliament for an increase of capital, and under the Act then obtained the maximum price of gas was fixed at 4s. per 1000 feet. The Company were also subjected to a limitation that, while on the original capital they might pay 10 per cent., they were only allowed to pay 7½ per cent. upon the new capital. Then came the Act of 1864, on which he principally relied for asking their lordships to pass the present Bill. By that Act the limits of supply were still further extended, and included Northfield, Yardley, and Solihull. As far as Solihull was concerned, it was provided that the supply of gas should be completed within two years from the passing of the Act. At the same time, the Company were empowered to charge 1s. per 1000 cubic feet more to Northfield and Yardley than to the people of Birmingham, but that was in consequence of the pressure brought to bear upon them by the Corporation. The Company were anxious for their Bill to pass, and so they consented to an injustice being done to the inhabitants of Yardley and Northfield. In 1875 the Corporation purchased the undertaking of the Birmingham and Staffordshire Gas Company, and, under the terms of the Act sanctioning that step, the Corporation guaranteed to pay to the Company 10½ per cent. and 7½ per cent. on their capital, and any other profits were to go towards reducing the borough rates. The maximum price of the gas was to be 4s. per 1000 cubic feet, with the exception of the parishes of Northfield and Yardley, in which the power to charge 1s. per 1000 extra was continued by the Act, and, in addition, the inhabitants of those parishes were deprived of the benefit of any of the profits, an advantage which had been secured to other outlying districts of Birmingham. It was stated that because those districts were sparsely populated, it was necessary to charge an extra 1s. per 1000 cubic feet, but he should prove that both Yardley and Northfield were thickly populated, and that the population in both places was rapidly increasing. It was unjust that Northfield parish, which was only a mile distant from the boundary of the borough of Birmingham, should be charged 1s. per 1000 more than Sutton Coldfield, seven miles distant, and the object of the present Bill was to remove that inequality. Indeed, the Corporation gas-mains, which passed through Northfield, supplied the people at King's Norton, who were charged the same as people residing within the borough limits. In the year 1877 the quantity of gas consumed in the two parishes, exclusive of street lighting, was 21,429,100 cubic feet, while in 1878 the consumption had reached 25,897,500 cubic feet, showing an increase of 4,468,400 feet—or nearly 25 per cent.—in one year. The extra 1s. paid by Northfield and Yardley in 1877 produced £1070, and in 1878 £1295, in which latter year the profit made by the Corporation on the sale of gas was £54,000, out of which £29,000 was added to the reserve-fund, and £25,000 went to reduce the borough rates. Northfield and Yardley, therefore, contributed nearly one-twentieth of the £25,000 for the reduction of the borough rates, while they did not participate in any advantage which accrued from it. Mr. Evans, the late Secretary to the old Staffordshire Company, who had recently met with an accident, and was, therefore, unable to be present, had given unwilling evidence in 1864, and then admitted that, so far as Northfield and Yardley were concerned, that differential clause was inserted on pressure, and simply for the sake of peace and quietness. He (Mr. O'Hara) contended that the opposition of the Birmingham Corporation was weak. Many objections were raised to the Bill on the ground of the Staffordshire Company having been bought on the existing conditions; but it was an extraordinary thing that in Northfield they agreed to supply Mr. Elliott with gas at 2s. 9d., and the Acock's Green and Northfield stations for 2s. 6d. Those charges proved that the Corporation could supply gas much cheaper than they were doing, and they had, therefore, no right whatever to keep the residents of Northfield and Yardley in the disadvantageous position they were in at present.

Mr. *R. Duke*, examined by Mr. CLIFFORD.

I am a solicitor, residing at Acock's Green, in the parish of Yardley. The centre of Acock's Green is 4½ miles from the railway station at Birmingham. The borough boundary is about 2 miles from Acock's Green, and there are consumers up to within a few yards of that boundary. Beyond the boundary the supply of gas was formerly not payingly productive, but that has ceased to be the case now. During the last year there have been over 2000 houses built in that district. The place adjoining the borough is called Spark Hill; it is within the Yardley district, and the differential rate is charged there. At Greet, which adjoins Spark Hill, there are likewise now a number of shops and private houses, and also a large mill, which consumes a considerable quantity of gas in the winter time. A lucifer match manufactory is also about to be erected, in which a considerable quantity of gas will be burned, and they also will have to pay the differential rate, unless the Corporation do with them as they have done with the railway authorities. I consider the district, as it has grown up, a fairly remunerative one. It must greatly increase, and the time is not far distant when Acock's Green will be connected by buildings with Birmingham. There is land within the limits of the Corporation which does not pay any better than that, or so well. Beyond Greet there is from half a mile to three-quarters of a mile comparatively unproductive, although there will be a small consumption. After that you merge at once upon Acock's Green proper and Tyseley, with their large consumptions. The differential rates cost me about 30s. a quarter. Acock's Green has increased nearly treble during the last nine years. There are some very large consumers living there, who pay 1s. more for their gas than they pay at their places of business in Birmingham, and we consider it a most iniquitous impost, and come to Parliament to ask to be relieved from it. I know Olton, which is in the Solihull district, and is a mile farther on than Acock's Green, and they pay 1s. less than I pay, although the gas passes through the main by my gate before they get it. I consider that very unfair.

Cross-examined by Mr. MICHAEL: Olton is without the parliamentary district of the Birmingham Corporation, and they have no power to take their mains there. The district of Solihull comes up to Yardley, but I am not aware that the price in the former place is 5s. 10d. The total area of Yardley is about 7000 acres, a large portion of which is agricultural land. I believe the Corporation would be compelled to lay mains for public lighting over the whole of that district if required to do so by a certain number of persons, however unremunerative it might be. In the session of 1875 there were three Bills before Parliament—those of the Birmingham Gas Company, the Birmingham and Staffordshire Gas Company, and the Corporation Gas Bill. I was solicitor to certain persons who petitioned against one of those Bills, but owing to some irregularity, that petition—which raised the question of the differential rate—was not received. The Bill for the transfer of the undertakings of the Gas Companies passed the House of Commons, and we did not petition against it in the House of Lords.

Re-examined by Mr. CLIFFORD: The reason we did not petition in the House of Lords was because another petition had been presented by the consumers of Birmingham, and we thought we could have been heard under that; but we were stopped on a question of *locus standi*.

Mr. MICHAEL: Was it not the fact that no person from Acock's Green signed that petition of the consumers?

Witness: Certainly not, because some of the persons who signed it were large consumers in Birmingham. I am aware they signed as Birmingham consumers, and not as consumers at Acock's Green.

Mr. CLIFFORD: Olton being within the Solihull district, I suppose it appears to you that they have a fear of competition before their eyes, or may have, and, that being so, the price is reduced 1s. below what you pay?

Witness: Exactly so.

Re-examination continued: Although the Company may be called upon to light Acock's Green, there is no chance of their being called upon to do so until it is likely to be remunerative. The feeling of the inhabitants at present is against having the district lighted, because they do not want to be rated for it. The Birmingham Corporation have gone to Sutton Coldfield, which is seven miles distant, and four miles from the supply of gas. There is also Erdington, Chester Road, and Wild Green, all between five and seven miles distant, which they are lighting at the same rate. I believe that at King's Norton one side of the road pays the extra and the other does not.

Mr. *J. Fordred*, examined by Mr. CLIFFORD.

I am a tradesman in Birmingham, and a considerable consumer of gas there, but I reside at Acock's Green. The price of gas at Yardley was in January 3s. 9d. per 1000. The persons who consume gas both in Yardley and in the borough are allowed to add the two consumptions together, and, if they amount to a total quantity of 100,000 cubic feet, they are then charged the minimum borough rate for the borough consumption, and 1s. extra for the consumption at Acock's Green. The price in the borough on Jan. 4, 1879, was 2s. 9d., but there has since been a reduction of 3d. per 1000 feet.

By the COMMITTEE: If I were not allowed to add the two quantities together, I should have to pay at a still higher rate, as the price is regulated by the quantity consumed. If I had not been a borough consumer I should have been charged 3s. 11d. The gain to me, therefore, was 2d. per 1000.

Examination resumed: The scale for consumers in Yardley, in January of the present year, was as follows:—Under 10,000 feet, 4s. 3d.; between 10,000 and 25,000, 4s. 1d.; between 25,000 and 100,000, 3s. 11d.; and 100,000 and upwards, 3s. 9d.; but there has been a reduction of 3d. since then. Within the borough the rates were 1s. less than the prices given.

Mr. CLIFFORD: Assuming that you had not been a consumer in Birmingham, what would your gas in Yardley have cost you?

Witness: It would have cost me the rate between 25,000 and 100,000, which would have been 3s. 11d.

But owing to the combined consumption being lumped, you are charged 3s. 9d. for the Yardley district. Does that strike you as a fair arrangement to consumers who are solely in Yardley?—Certainly not.

Examination continued: I am not aware that there are any public street-lamps in Yardley. Acock's Green is ceasing to be of a rural character; there are a large number of railway season-ticket holders between that place and Birmingham. I think the consumption of gas in Yardley would be much larger if the prices were lower; and I believe many gentlemen would use gas cooking-stoves. I was present to give evidence in 1875, but owing to the decision as to *locus standi*, my evidence could not be taken. I have myself discontinued the use of gas for certain purposes, on account of the price. There has been a large meeting at Yardley to authorize the promotion of this Bill, at which a general feeling in its favour was expressed.

Mr. *J. H. Matthews*, examined by Mr. KNOTT.

I am the Chief Accountant of the Great Western Railway Company. The quantity of gas supplied to Acock's Green station for the quarter ending Dec. 31, 1878, was 49,600 cubic feet, and the price charged 2s. 9d. per 1000. In the previous quarter the quantity supplied was 22,400 cubic feet. For the quarter ending March 31, 1879, the quantity was 40,600 cubic feet, and the price charged was 2s. 6d. The Corporation supply the whole of our

stations in Birmingham and the district. We are very large consumers, and pay the same price all round. The number of season tickets in force between Birmingham and Acock's Green is 272.

Cross-examined by Mr. MICHAEL: We pay the Corporation about £1400 a year for gas.

Mr. *H. W. Elliott*, examined by Mr. CLIFFORD.

I reside at Sellyoak, in the parish of Northfield, and am Managing Director of some metal wire-works. I am also a member of the Rural Sanitary Authority at King's Norton. Our company are large consumers of gas, which at present we manufacture ourselves. We entered into negotiations with the Corporation of Birmingham last year with reference to an increase in our supply, but they failed, because the Corporation wished to supply the whole. Their proposal, made on Aug. 13 last year, was that we should be charged 2s. 9d., less 5 per cent. for prompt quarterly payments, if we took the whole of our supply from them. That would have worked out to about 2s. 7½d. per 1000 feet.

By the COMMITTEE: Sellyoak is about three-quarters of a mile out of the borough of Birmingham.

Examination resumed: There are a great many new houses being built in the parish of Northfield, particularly in the neighbourhood of Sellyoak, which is now a large manufacturing village. I do not think the differential rate is fair to the consumers in Northfield, and I cannot see any valid reason for its continuance.

Cross-examined by Mr. MICHAEL: I dare say that the area of Northfield is 5789 acres, and the population is 4609, but I do not know of my own knowledge. The greater part of the land is agricultural, of course.

Mr. MICHAEL: Do you know that under the Act of 1871, which is incorporated by the Act of the Corporation, they can be called upon to lay down mains and supply public lights over the whole of that district, at whatever loss it may cause?

Witness: I do not know that; but supposing the mains were extended over the whole parish, no doubt that would be an onerous obligation.

Cross-examination continued: The additional gas we required was for a comparatively new building, in which the pipes were not laid; but the Corporation declined to supply us. We are large consumers of coke at our works.

Mr. MICHAEL: Therefore your ceasing to make gas would also be an advantage to the Corporation in having you as a customer for coke?

Witness: Yes; it would, to a certain extent.

Re-examined by Mr. CLIFFORD: I think that a complaint has been made of the lamps which have already been put down by the Rural Sanitary Authority. The rural part of the parish is complaining of lamps being placed where they are said not to be needed.

Mr. *R. Docker*, examined by Mr. O'HARA.

I am a solicitor in Birmingham, and have been Clerk to the King's Norton Union for 40 years. I am also Coroner for the county of Worcester. I produce a copy of the gas accounts of the Corporation of Birmingham for the year 1878, in which it is stated that the net profit for the year, after paying for the annuities and all expenses, was £54,831 17s. 8d., out of which £25,000 appears to have been paid to the borough improvement account. That is a fund from which the ratepayers of Birmingham alone derive any benefit. The amount of gas consumed in Northfield and Yardley during the year was 25,897,500 cubic feet; and in addition to that there were 3 million feet consumed by the public lamps in Northfield. The highest price charged for gas was 4s. 3d. per 1000, with a reduction of 5 per cent. The public lamps were charged at the rate of about 2s. 5d. per 1000 feet. The public lighting in Northfield is done by contract with the Corporation; 13s. is the statutory charge for the supply, cleaning, and lighting of the lamps, and two guineas per lamp is the charge for the gas. That contract is made in pursuance of a clause in the Act of Parliament which provides that the amount to be charged for the public lamps shall be by agreement between the parties, and in case of disagreement, by arbitration. The total amount consumed in 1877 was 21,429,100 cubic feet, exclusive of the quantity consumed in the public lamps. The extra charge of 1s. last year amounted to £1300 in the two parishes. The population in Northfield is increasing very rapidly, and building is going on faster now than at any previous time. By the Act of 1864 a maximum price of 5s. per 1000 was imposed upon Northfield and Yardley, and a compulsory difference of 1s. In the notes of proceedings before the Committee in that year there is no mention whatever of this clause, but at the end of the notes it appears that certain clauses were submitted to the Committee and agreed upon; so that, in fact, the provision now objected to was inserted at the last stage of the Bill in the second House. The Lighting Authority at Northfield was constituted by an order of the Local Government Board in July, 1877, and shortly after communications were made to the Lighting Committee of the Birmingham Corporation with the view to a reduction in price, but they declined to accede to our request. In the first instance we asked them to charge us 1s. per 1000 less—a similar amount to what they were charging in every other part of the district. Their only reply was that they were obliged by Act of Parliament to charge it. In consequence, statutory meetings were held at Northfield, under the Borough Funds Act, for the promotion of the present Bill. All the forms of that Act were properly gone through, and the people of the district quite approved of it. We were seconded in our efforts by the parishioners of Yardley, who, although not having a Lighting Authority, came in under our wing.

Cross-examined by Mr. MICHAEL: The Corporation made us an offer either that we might have the undertaking at an agreed price, or purchase the present income without regard to the future increase of it, but at a valuation in either case. So far as the public lighting is concerned, the Corporation have charged us the lowest rate that they charge to any one in the borough of Birmingham, and in that respect I think they have treated us very well.

Mr. MICHAEL: If I rightly appreciate what has been put forward, you are still a Rural Authority at Northfield, but you have urban powers so far as lighting is concerned, and therefore you can call upon the Birmingham Corporation to lay down mains and supply lights over the whole of the district?

Witness: No doubt that could be done, supposing the terms of the Act of Parliament were enforced. That is also the case as to Yardley and King's Norton. I may add that we have had frequent applications at Northfield to extend the public lighting, but the Authority has refused when there is not sufficient population to justify the expense. I do not know the price charged by the Solihull Gas Company at the present time, but I believe it is higher than that charged by the Corporation.

Mr. *H. Hawkes*, examined by Mr. CLIFFORD.

I reside in Northfield, and am a Justice of the Peace for Worcestershire and Coroner for Birmingham. I was Mayor of Birmingham 25 years ago, and have been an alderman ever since. I remember the proceedings of 1864 very well, with regard to the promotion of the Staffordshire Bill. There was another Bill pending at that time for the establishment of a Consumers Company. The Town Council appeared on petition to watch the Consumers Bill, but they opposed the Staffordshire Bill in earnest. The 12th clause [relating to the difference of 1s. in price] was introduced into the Bill at the instigation of the Corporation of Birmingham as against the Staffordshire Company.

Mr. CLIFFORD: Was there any special notice taken of the clause before the Committee?

Witness: I speak for the Town Council, and I say that they never heard of the clause until after the Bill became law.

Why was the clause considered necessary by the Corporation of Birmingham?—The point urged was that the Staffordshire Bill was going into new ground—viz., Northfield and Yardley, which were very sparsely populated—and it was thought it might be an unprofitable outlay of money; therefore, for the protection of the consumers in the populous parts, the extra shilling was put. The Company did not approve of it, but they submitted.

At that time the supply of gas was in the hands of the Company, and, therefore, it was to the interest of the Corporation to see that the price of gas was not kept up by unremunerative expenditure?—Just so; in Birmingham.

Was there any mention of this clause at any meeting of the Council which you attended?—None whatever. Neither was there in the Parliamentary report.

I need not ask you whether, if that clause had been discussed at all, it would have been considered by the Parliamentary Committee?—Yes; the Parliamentary Committee of the Town Council would have reported it, and we should have discussed it.

In 1875, I believe, you were Chairman of the Parliamentary Committee of the Corporation promoting the Bill for the transfer of the Staffordshire undertaking to the Local Authority?—Yes.

In discussing the propriety of purchasing the gas undertaking, and in estimating the value and the price to be given for it, did clause 12 come into the consideration of the Town Council?—Not in any way whatever, to my knowledge or belief.

Then the maintenance of this differential rate was not, so far as the Parliamentary Committee of the Town Council of Birmingham was concerned, an element of value in reckoning the price of the gas undertaking?—No. We told our counsel to call it an odd clause; we did not know anything about it.

Acting upon that instruction, did Sir E. Beckett open the case in this way: "It may be apprehended by some of the people outside that we might keep up the price against them while we lowered it in the borough. That would undoubtedly be an unfair thing to do, and there is an absolute prohibition against it, excepting with regard to two places—Northfield and Yardley—as to which there was an odd provision inserted in a former Act that the price to them should be about 1s. more than the price within the borough. That we are not responsible for; we take it as we find it, and do not alter it, because there is no special complaint upon the point"—so that your counsel described that clause, according to your instructions, as an "odd" clause, and disclaimed all responsibility for it on your behalf?—Yes; that is so.

You are not promoting this Bill with any personal object, are you?—No. The gas does not come within two miles of my house, and I would not have it if it passed the door.

As a member of the Rural Sanitary Authority, is there any danger, in your opinion, of the onerous liability being cast upon the Corporation of Birmingham, which has been referred to, as to the public lighting in that district, with regard to the necessity of providing public lamps?—We are the Lighting Authority, and a duty is imposed upon us which we must perform. We are not, however, likely to call upon the Corporation to perform that duty until we have a sufficient population.

Cross-examined by Mr. MICHAEL: The Corporation of Birmingham presented a petition against the Staffordshire Bill of 1864.

Mr. MICHAEL: I have a copy of the petition before me, and I will read the part upon which we rely: "That if your Honourable House should think right to grant any material extension of the limits of the Company, the interests of your petitioners and of the inhabitants of the district now supplied by the Company ought to be amply protected, and it ought to be rendered compulsory on the Company to charge their gas supplied within the new district at a price considerably higher than they have from time to time charged under similar circumstances within the present district?"

Witness: I say at once that the Town Council did not have that petition read to them, nor was it voted by them. It might have been presented by the Public Works Committee.

Would you, as a member of the Town Council, if you had apprehended that gas was going to be supplied in the new district at a loss, have thought it important to protect the consumers of gas in Birmingham against such an extension of the limits as would involve a loss to the consumers?—No doubt, if I had been informed that it would be a permanent loss to Birmingham, I should have advised some steps to be taken for protection; but I am not prepared to say such a step as putting on a differential rate.

You are aware that under the Act of 1847 the Staffordshire Company could only be called upon to reduce the price of gas when they had obtained their maximum dividend, and their reserve-fund was filled. Therefore, if they had expended in this district a capital which was unremunerative, would it not have tended to defer the period when that reduction in the price would have occurred?—Obviously; but I should have advised resistance to that improvident outlay, and probably it would have been to resist the extension of their powers at that time.

Re-examined by Mr. CLIFFORD: In 1864 the Corporation of Birmingham naturally wished to protect the consumers of the borough against unremunerative expenditure outside; but the circumstances are not the same now, because the Corporation do not require to be protected against their own acts—they can do as they like, and can protect themselves by refusing to extend into unremunerative districts.

Mr. *G. W. Stevenson*, examined by Mr. O'HARA.

I am perfectly familiar with Birmingham and all the surrounding districts, with regard to the supply of gas. I was a witness in the arbitration between the West Bromwich Town Commissioners and the Corporation of Birmingham, and also when the Bill was before Parliament. In my opinion, the differential rates charged to the consumers of gas in Yardley and Northfield are most unjust at the present time.

Mr. O'HARA: You have looked into the accounts of the Corporation. Have you made any calculation at what price the Staffordshire Company would probably have charged the consumers in those places had they remained?

Witness: In adding the increased consumption and the increased capital, I think the Staffordshire Company, if they had remained in possession of their undertaking, would, at the present time, have been charging 2s. 6d. per 1000 feet, or thereabouts.

By the COMMITTEE; I base that calculation upon the sale of gas and the statutory limit of profit, which compels a reduction in the price.

Mr. O'HARA: You have compiled a very valuable book, giving statistics of the legislation that has taken place for many years as to gas. Do you know of any places where differential charges are made which are in any way analogous to Northfield and Yardley?

Witness: There is no single instance in which a company or a corporation charging, say, 4s. within the borough or first district, charge a higher price than 4s. in the intermediate district, and then again 4s. in the district beyond. I do not suppose Parliament would ever pass an Act

with any such stipulation in it. There is sometimes a limitation dependent on the quantity. In the Preston Gas Act of 1865 there was a differential charge which was to cease when the district outside Preston—named Fulwood—consumed 1 million feet per annum; and it is within my knowledge that that differential rate did cease within one year after the passing of that Act. Having regard to justice and what is fair, there is no reason whatever why the people in Northfield and Yardley should continue to pay 1s. more per 1000 feet than Birmingham. The supply in those districts was about 26 million feet in 1878, and the consumption in Sutton Coldfield is about 1¼ million; and yet the Corporation of Birmingham supplied the latter place at the Birmingham price, and charged Northfield and Yardley 1s. more.

Mr. MICHAEL: You are in error; it is 10 millions, not one?

Witness: No; the accountant of the promoters has investigated the books of the Company, and reported.

Mr. MICHAEL: He has forgotten to put a nought at the end. You may take it from me it is 10 millions.

Cross-examined by Mr. MICHAEL: There are a great number of places with different rates—probably 116—but I do not know that the anomalies in any of those cases are greater than the anomaly cited here.

Mr. MICHAEL: Take Swansea; the borough, extending for five miles, at the farthest extent charges 3s. 6d., while five miles in the other direction the charge is 5s. 6d., making 2s. difference?

Witness: It may be so. In the present case my calculation went to show that, supposing the Staffordshire Company were still carrying on their undertaking, and supplying gas at an equal rate throughout the whole of their district, irrespective of those clauses compelling them to supply Northfield and Yardley at 1s. higher than the rest of their district, 2s. 6d. per 1000 feet would pay them for the whole.

But still the obligation would remain that it was compulsory to charge that difference?—It was obtained by the opposition of the Corporation of Birmingham.

You know we have offered to transfer the undertaking, so far as the supply to Northfield and Yardley is concerned, into the hands of the Trustees for those districts. Would not that be a fair proposition to get rid of this difficulty?—It would be very well to do so after you had got rid of this difficulty, but a very great hardship upon Northfield and Yardley to have to purchase this portion of the undertaking with the 1s. per 1000 feet added to the price you are charging elsewhere.

The terms of the purchase were that they purchased the whole of the profits obtainable under the Act of Parliament?—That is so.

The Staffordshire Company were in Parliament the same session, in order to obtain additional capital; so that if the Corporation Bill had not passed, the Staffordshire Company would have been able to carry on their operations?—With increased capital.

And no opposition from any one as to this increased charge in Northfield and Yardley—no petition against either the Corporation Bill or the Staffordshire Bill?—The consumers might have appeared, but whether they would have had a *locus standi* is another thing.

You know that on the general question there was a petition of consumers very actively fought?—Yes; but that was within Birmingham. The petitioners were consumers in the borough against their own Bill.

Were there not also consumers outside the borough of Birmingham?—Represented by a local authority; and in such a case they are not allowed to appear individually.

Was it not the fact that the money paid represented the whole of the maximum dividends which could be earned by the Staffordshire Company under their own existing powers?—It represented 25 years purchase of the maximum dividends.

And one of the powers of earning the dividend was that of raising money by the addition of differential rates in those two districts?—The Corporation purchased the right to supply gas through this district at 25 years of the maximum dividends payable to the Staffordshire Company. Any price that the Company charged for gas beyond what was required for the realization of those maximum dividends was not bought; and therefore, inasmuch as the Corporation have a surplus of £54,000 a year by the price they were charging last year over and above what was required to pay maximum dividends, the 1s. per 1000 feet, amounting to £1300 in the year, was not required, and was not purchased in Yardley and Northfield.

Is it not the fact that if the Corporation had not purchased those works, additional capital would have been raised by the Company which would have deferred the time, seeing that additional capital would require additional profits to pay maximum dividends upon it?—Yes; and it would be a great deal better for the consumers if the works had remained in the hands of the Company.

You know that large sums of money have been expended by the Corporation upon their works?—Yes; and at the same time they complained that large works were thrown on their hands.

The transfer of the West Bromwich and those other works has nothing to do with the supply to the south?—I think it has.

If the Birmingham Corporation stood on one side, and Northfield and Yardley had to erect their own works, at what price could they supply gas?—I could only give an approximate answer; but I should think at considerably less than the price at Solihull, which is 5s. 10d. Northfield and Yardley are, however, bound to get their supply from the Corporation of Birmingham; they have no option.

You put it on equitable grounds to the Committee that they ought to be relieved of this differential rate, because they can supply themselves with gas cheaper?—No; I do not say so, because the conditions which applied at that time—1864—to the 1s. differential rate have ceased to exist.

Is it not in the power of the Lighting Authority, under the Gas-Works Clauses Act, 1871, to call upon the Corporation to supply every single district?—The authorities would never be so absurd as to require the Corporation to supply all the roads in the rural districts with lamps which must be placed not more than 50 yards apart. That power would only be exercised when the roads became built upon.

Re-examined by Mr. O'HARA: The ratepayers move the Lighting Authorities, and they would not desire that roads passing through a purely rural district should be lighted.

The CHAIRMAN inquired if it was intended to call any more witnesses of a similar character. If so, he thought it would be sufficient to ask them to corroborate the evidence already given, unless they had anything additional to adduce.

Mr. *H. E. Jones*, examined by Mr. O'HARA.

I have heard the evidence of Mr. Stevenson, and corroborate every word he has said. I have also considered what it would cost these people to establish works for the supply of 26 million feet of gas for themselves, and I find that, if they establish those works, they could afford to sell gas in the district as it now exists at about 2s. 9d. per 1000 feet.

Cross-examined by Mr. MICHAEL: I think the works could be established for an outlay of £20,000. To make and deliver the gas would cost about 1s. 9d. per 1000 feet, and the interest upon capital, at 5 per cent., would come to about 9d. more, making 2s. 6d. Then, taking 3d. for contingencies, they could very well afford to supply gas in the two districts at 2s. 9d. per 1000. I am supposing that Northfield and Yardley are joined together, and that it is a public Lighting Authority, and not a company who carry on the works.

Mr. MICHAEL: How much have you taken for repayment to sinking-fund?

Witness: I have simply taken 5 per cent. interest on the outlay. I have made an allowance for renewing the *corpus* of the undertaking, hoping the concern always to have a value.

Do you not know that public authorities having gas or water-works are obliged to pay, in a certain number of years, the whole of the principal sum they have borrowed? How much have you put down?—I have not taken it into consideration; it probably amounts to another 1d. or 2d. per 1000.

Cross-examination continued: I have been governed in my calculation by what I know to be the cost of coal to the Birmingham Corporation, and also from a knowledge of the fact that the small district of Walsall, not far distant, continues to sell gas at 2s. 6d. per 1000. I make the cost to the Corporation in 1878, 1s. 9d. per 1000.

Mr. *F. J. Bramwell*, examined by Mr. CLIFFORD.

I have had very great experience in the question of Birmingham gas. I was an arbitrator under the Act of 1875, in assessing the value of the undertaking in the outside districts, and also under the separate Acts of the Local Board in connection therewith. I believe the gas sold in Northfield and Yardley would be perfectly remunerative at the Birmingham rate. The quantity of gas sold in those two parishes last year was 1-96th of the whole of that sold by the Corporation of Birmingham. If, therefore, the 1s. rate were repealed, it would put one-eighth of a penny on all gas throughout the district for the purpose of returning the Corporation the sum they would lose by the reduction in Northfield and Yardley; and that would only be on the assumption—which I believe to be wrong—that the immediate effect of the reduction would not be to give them any increase of consumption; whereas the effect of the reduction would be to increase the consumption. Having regard to that prospect, I should have thought the Corporation would have been glad to be relieved of the necessity of making the differential rate.

Mr. MICHAEL (in cross-examination): There is another way of putting the matter. That one-eighth of a penny represents £1000 a year, and that is worth 25 years purchase, or rather £25,000 loss to the Corporation?

Witness: No; they do not lose it. In the first place, they are not charging their maximum rates, which shows their object is not to make the utmost profit that can be made; and I can see no reason why there should be a deduction below the maximum rate in the other parts of the district, and why this district should be kept at the 1s. higher price.

Mr. O'HARA said that was the case for the promoters.

The following evidence was then called on behalf of the Corporation of Birmingham.

Mr. *Joseph Chamberlain*, M.P., examined by Mr. MICHAEL.

I am one of the Members for the Borough of Birmingham, and also an alderman. I undertook all the negotiations for the transfer of the undertaking of the Birmingham and Staffordshire Gas Company to the Corporation in 1875, and watched the proceedings in Parliament on the question. Those negotiations were based wholly upon the profit which had been shown to have been made by the Staffordshire Company. The additional rate in Northfield and Yardley undoubtedly constituted a portion of that profit. I did not look to the methods by which a profit was obtained, but merely to the figures showing the total amount. I was aware that differential charges were very common in the case of gas companies. I thought the differential rate was justified, because it is more costly to supply gas at a distance than it is close to the works. Much greater pressure is required to force the gas to a distance, and that involves an increased rate of leakage, which is a very heavy item in the expenses of gas companies. In addition, there is a larger outlay of capital in proportion to the return. In my opinion, the Corporation were wrong in not interfering at an earlier period than they did, and insisting on a differential rate. It is no grievance to Northfield and Yardley that other outside districts happen to have obtained extremely favourable terms from the *laches* of previous members of the Corporation. So far as the Corporation are concerned, we are merely continuing what occurred in the Bill of the Staffordshire Company.

Mr. MICHAEL: We have not had it distinctly proved whether any objection was taken, at the time of the passing of the Act of 1875, to the continuance of the differential rate.

Witness: No objection was taken in Parliament. Private objections were made to me on behalf of the Corporation, but the parties who made them did not support their views before the Committees of the two Houses.

Examination continued: The present average price to Northfield and Yardley is 3s. 6d. per 1000 feet, but we are authorized to charge 5s. We should be very glad if those districts would buy the right to supply at the price which we may be said to have paid for it, and take the difficulty away altogether. Our offer to them was that they should buy the right to charge the differential rate at its present value, and I proposed to make no charge to them for the prospective increase; and therefore if their contention is that the district is likely to increase in population, they have the means of securing any advantage which that will be to themselves by accepting the offer I made to them.

Mr. MICHAEL: You do not contest, I suppose, that it is possible you might supply from Birminghan at rates such as was stated by the title of the promoters Bill, but that you absolutely will be sacrificing a property which you have paid for?

Witness: We have paid for it at a rate which leaves us a small percentage; and, so far as regards the district, that profit will be wholly destroyed if we were to sell at the lower rate. I can show that in this way. It has been said our profit last year was £54,000, but that is not quite accurate. The net profit, which we considered ourselves justified in carrying to the improvement rate, was only £25,000. Part of it went to form a sinking-fund, which is really a depreciation account against the necessary depreciation of capital expenditure in a great undertaking; and I consider, therefore, that our real net profit is £25,000 per annum. The capital which the Corporation of Birmingham have invested in the undertaking is, at present, limited to £2,200,000, and, therefore, the net profit we make is barely 1 per cent. on our capital. I consider, so far from that being a large profit, that it is a very small profit, having regard both to the ordinary risks of manufacture and to the possibility of the particular manufacture being superseded; and I should be very much disappointed if the opinion I expressed before the Houses of Parliament, when this transfer was completed, does not turn out to be correct, and if we are not enabled in the future to make a much larger profit than the present amount which the learned counsel has complained of. Therefore, inasmuch as we make only 1 per cent. on the whole of our undertaking, we must make much less in this district, which is subject to the disability of being situated at a considerable distance from the central works; and, if the power to charge the extra rate is removed, I doubt whether there will be any net profit at all. Northfield and Yardley cannot be called on to contribute anything to any possible loss in connection with the undertaking of Birmingham. The whole risk lies on that town, but Northfield has shared, and will con-

tinue to share, in the prosperity of the gas undertaking, because, when that prosperity enables us to make a reduction, we make a proportionate reduction to Northfield and Yardley; and we have, since the undertaking passed into our hands, reduced the price of gas in these two districts. We strained the law a little to deal courteously and liberally with a public authority, and made the price for the public lamps in Northfield the same as the price for the public lamps in Birmingham.

You also allowed the consumption in Birmingham and these outlying districts to be added together, and that is brought against you as though it were some act which affected prejudicially the consumer?—The only case which has been brought to the notice of the Committee is that of the Great Western Railway, and there it appears that the whole of the accounts for all the stations within the district of supply of the Birmingham Corporation are lumped in one account, and the same amount charged for all, without taking the trouble to separate every small sum required for these local stations. That was a practice adopted by the Staffordshire Company before the transfer to us, and we have merely followed in the footsteps of our predecessors.

There was another case, where a tradesman living in Birmingham was allowed to add on his consumption in Acock's Green, to come up to the amount of consumption which would give him the minimum price, so you have helped the consumption in that way also?—Yes. In that case he was charged at rates according to the total consumption, but he was charged at a differential rate with regard to his supply in Acock's Green.

Examination continued: With respect to the Olton Company, they consume a very considerable quantity of coke in their furnaces, and when the negotiations commenced, the Corporation were very much troubled with an overstock of coke, and our chief object was to obtain a sale to that Company. In the course of the negotiations it was suggested that they should take their gas specially from us. On our side it was felt we should be able to use the main-pipes during the daytime, when they were not employed for any considerable consumption, to convey the gas into their gasholder. They would then have a stock of gas for use in the night, and it would be no increase of expense to us to supply them in this way. We could supply them with gas, in consequence of their having their gasholder, at a less cost than other parties; and we said, under all the circumstances, if they would take their coke specially from us, we would supply them at the lower rate in bulk. It was an exceptional transaction arising out of those circumstances, but they refused to take their whole supply, and as our object would have been defeated, we declined to supply them unless at a differential rate.

Mr. MICHAEL: In your opinion, are there any circumstances which would make the sale of gas in Northfield and Yardley, supposing a separate company were established for the purpose, cheaper than the supply from a company established at Solihull?

Witness: Yes. They are nearer to Birmingham, and could get their coal a little cheaper. I have seen a very careful calculation showing that the maximum cost in those districts would be 3s. 9d. per 1000. With regard to Olton, the Corporation of Birmingham originally supplied them at the differential rate charged to Northfield and Yardley, and it was only on that understanding that the supply was given; but afterwards it was contended, on behalf of the inhabitants, that we had no power to charge the differential rate, and the Corporation were advised that such was the case, and they were obliged to reduce the rate to that within the borough. Respecting the anomaly, which is said to exist in our case, of a district nearer to the works being supplied at a higher rate than a district farther from the works, I have caused inquiries to be made, and I have one or two striking cases. At Cardiff the rates are 4s. and 4s. 6d., and the lower rate is charged as far as two miles from the works, while the higher rate is charged at a distance of 1½ miles from the works. Then at Reading there is an additional rate of 1s.——

Mr. O'HARA objected to the evidence, as each of those cases was under an Act of Parliament which spoke for itself.

Mr. MICHAEL said he would not press the point. (To witness:) There is one point of importance—Did the Corporation Act make any difference in the maximum prices charged over these districts?

Witness: Yes, it did; it reduced the maximum by 6d. It was 4s. 6d. and 5s. 6d., and is now 4s. and 5s.; but the actual price is 2s. 6d. within the borough, with the additional 1s.

Cross-examined by Mr. O'HARA: My impression is that the maximum price with the Birmingham Company was 4s., and with the Staffordshire Company 4s. 6d.

Mr. O'HARA: You have said you think it fair to charge a different rate for all these outlying districts. Did you make that representation to the Committee in 1875?—Certainly not.

But I did, and did not the Committee insist that what you charged inside the district you should charge outside?—No; it was put in voluntarily by the Corporation, and was offered by me personally to all the opponents before we were in the House at all, and was subsequently inserted according to promise.

Cross-examination continued: So far as liability to capital is concerned, Northfield and Yardley are no better off than all the other outlying places, but we are bound, no matter what our intentions are, to charge the extra 1s.

By the COMMITTEE: The capital invested in the gas-works does not belong to us, and we do not get dividends upon it. We have borrowed £2,200,000, and have made ourselves responsible for it, and against that risk we get a profit of £25,000 a year—that is all.

Mr. O'HARA: In how many years will you be obliged to put something by towards the sinking-fund? Is there not a maximum?

Witness: No; we are bound to repay the whole of the capital in a certain time.

You said you looked for an increase of profits, and you hope you will gain more and more every year?—I told the Committee of the two Houses so when the Bill was under consideration.

When you bought this concern, did you not think it a very good bargain?—I think it was a good thing.

Re-examined by Mr. MICHAEL: If we were obliged to give up any portion of our bargain without a consideration, it would be a confiscation. There is hardly any property with a parliamentary title which would be safe if this were so taken away. It was bought on the basis of an Act passed when Parliament was in full possession of all the facts.

Mr. O'HARA read some extracts from the evidence given in 1875, and asked the witness whether he was still of opinion that the matter was fully gone into in that year.

Witness said, in his reply to Mr. Michael, he was speaking of 1864, and not of 1875.

Mr. MICHAEL then quoted at some length from the evidence given in 1875, and contended that it was evident that the whole matter was before the Committee in that year.

Witness said that was so, and the Committee themselves pointed out the apparent inconsistency of the clause, but still it was passed.

Mr. MICHAEL: And you paid the additional £25,000, capitalized at £1000 per year, upon the continuance of that differential rate?

Witness: Yes; and taking it away at this time would involve a loss of £25,000 to the Corporation of Birmingham, either as representing the ratepayers, or as representing the consumers.

If taken away, ought it not to have been taken away when they would have let you claim a corresponding reduction from the selling Company?—Yes.

Mr. *H. Hack*, examined by Mr. MICHAEL.

I am one of the Gas Engineers of the Corporation of Birmingham, and was formerly Engineer to the late Birmingham and Staffordshire Gas Company. In 1864 the Staffordshire Company supplied King's Heath, part of the parish of King's Norton. King's Heath is about one-third of a miles nearer the gas-works than the boundary of Yardley, and about 1¾ mile nearer the gas-works than the boundary of Northfield. In 1866 the Staffordshire Company laid a trunk main for the supply of Yardley and King's Norton. Through being empowered to charge 1s. more, it answered the purpose of the Company to expend that money. But for that 1s. I should not have recommended the Company to go to King's Norton, which is quite an agricultural district, and so is Northfield and Yardley, except in certain small parts which are built over. In 1878 the consumption of gas over the whole area of the Corporation supply was 2,494,495,000 cubic feet. The total length of mains laid to the end of that year was 598 miles, giving an average consumption per mile of main of 4,600,000 feet. The consumption in Yardley in 1878 was 15,563,500 cubic feet, and the number of consumers only 573. The consumption per mile of main there was 1,174,600 feet. I have made an estimate of the cost of the mains, meters, and services in Yardley, and it amounts to £14,400, working out to about £925 per million feet of consumption. The distance from the gas-works to the nearest boundary of Northfield is 2 miles 286 yards, as the crow flies. The consumption there in 1878 was 10,334,000 cubic feet, and the number of consumers 250, giving a consumption per mile of main of a little more than 1 million cubic feet. On the mains and distributing plant at Northfield £9797 has been expended, equal to £947 per million feet of consumption, while in populous places £200 is a fair sum to allow for distributing plant. In my opinion, the circumstances of the case warrant an additional price being charged in Northfield and Yardley, and I consider 1s. to be a very fair sum. The size of the trunk main for the supply of those two districts is 16 inches diameter, and it is large enough to meet the increase in consumption for many years to come.

Cross-examined by Mr. CLIFFORD: I have not worked out the figures with regard to Sutton Coldfield, which is a fairly-populated district. I heard Mr. Bramwell state that, assuming the obliteration of this differential rate, the result would be one-eighth of a penny additional charge per 1000 upon the whole district, and I believe it will be about that. It must be a very long time before the two districts in question can pay a remunerative price upon the outlay expended. If the differential rate were reduced, the consumption might be increased; but I think it would be very insignificant. There is another Gas Company in Sutton Coldfield, but we have gone through that place, because it is within the limits of our supply. We have recently extended the mains there. At the time of the transfer our mains extended about a mile into Sutton Coldfield, but since May, 1877, they have been extended perhaps three miles. I am prepared to supply the data as to the cost of the mains in Yardley. There are 67 yards of 2-in. main at 2s. 1d. per yard, £6 19s. 7d.; 353 yards of 3-in. main at 3s. 2d., £87 1s. 2d.; 6851 yards of 4-in. main at 4s. 3d., £1455 16s. 9d.; 7387 yards of 6-in. main at 6s. 5d., £2369 19s. 11d.; 1848 yards of 8-in. main at 9s. 1d., £839 6s.; 537 yards of 12-in. main at 15s. 8d., £420 13s.; and 4708 yards of 16-in. main at 24s. 5d., £5728 1s. 4d. Then there are meters—137 3-light at 40s. each, £274; 199 5-light meters at 50s., £497 10s.; and 134 10-light meters at 70s., £469. I have worked out the figures, and the total amounts to £14,000. Those mains were laid with exclusive reference to the supply of those two districts; Olton was not in view at all. I consider mains of that size were necessary, having regard to the future; and I think we ought still to retain the differential rate, notwithstanding the prospects of increased consumption and considerable profit. Consumption still goes on in Birmingham and other districts at the same rate. By having a large main we can keep down the pressure at the works. If we had smaller mains we should have to keep up an increased pressure, whereby we should have extra leakage and less profit than at present.

Re-examined by Mr. MICHAEL: I consider that a proper and economical mode of working. To put down a small main and when there was increased consumption to take it up and lay down a larger one, would be most unwise. One of the chief points a gas engineer attends to is to keep down the pressure. I do not know the exact consumption in Olton, but at the present time we have 48 customers there. Our mains extend several hundred yards into Olton, but I do not know the precise distance. We are simply there on sufference. We first supplied at the additional 1s. rate, but when our mains were laid in the district we were put under pressure to supply at a cheaper rate. There is a Corporation at Sutton Coldfield, and we have extended our mains into and beyond the town. The price charged by the Sutton Coldfield Gas Company at the time we did so was 5s. 6d. It was at the request of the inhabitants that we extended our mains there.

THURSDAY, JUNE 26.

Mr. *R. P. Spice*, examined by Sir E. BECKETT.

I have been familiar with the subject of gas supply in Birmingham and the adjacent districts for several years. Supposing the legislation of 1864 had not taken place, and that the Corporation were now bringing in a Bill to supply those two outside places, they would not dream of doing so without a higher rate being charged; no one would ever think of taking gas from Birmingham to such places at 2s. 6d. per 1000 feet. I think a differential rate of 1s. is very reasonable. It is very rare indeed that an outlying district is placed upon the same terms as the centre of a city or a town. There is also the fact that when a Corporation are the owners of gas-works they have all the risks, while the outside people have none. Sometimes there is what is called a guarantee-rate inside the town. Differential rates are charged by companies as well as corporations. In the case of Brighton the difference allowed was 1s. 6d. The rate varies from 6d.—which is the lowest I know of—to 3s., and includes all sums between. With regard to the evidence given yesterday, to the effect that £20,000, or some such sum, would be sufficient to establish independent gas-works for those two districts, I say that, on the face of it, it is a fallacy. Engineers are accustomed to regard the proportion of capital to rental for such concerns as this to be somewhere about £1000 per million feet; but the rate varies in degree with regard to the circumstances of each particular case. In this very case of Birmingham, last year, it was agreed that about £600 per million would be a fair sum to pay for an undertaking of such a magnitude. It is, however, not an uncommon thing for the capital to range as high as £2000 per million, instead of £1000, which I take in the present instance as the requisite capital to carry on the business of supplying Northfield and Yardley. But that is not all; it is not merely the capital that is required to do the business at the present moment. For example, if we were setting up works anywhere, we should erect them equal to an increase of 50 per cent. in capacity beyond the present requirements, which would be providing for only six years to come, at the ordinary rate of growth. To provide 26 millions would require works equal to supplying 39 millions; and, therefore, instead of £20,000, it is £39,000 which must be

calculated upon as being absolutely required to provide for the wants of those two places. Comparing these districts with the one immediately beyond—the parish of Solihull—I find the gas consumers there pay 5s. 10d. per 1000 feet for their gas, with a charge for meter-rent equal to 2d. per 1000, so that they are really paying 6s., and last year the absolute divisible profits upon that business only amounted to 3¼ per cent. upon the capital then employed. Since then they have spent more capital to make their works equal to the requirements of next year, or the year after, or it may be three or four years to come, and they would not be able to pay 3¼ per cent. at 6s. At Knowle the same price is being charged, and although the works have been in existence for three years, they have not reached so far as thinking about a dividend yet, and there is no prospect of one. If Northfield and Yardley were left to themselves, they could get their gas for less than at Solihull, because the two, being combined, are more conveniently and advantageously circumstanced. Under the most favourable conditions I can imagine, I think they might be able to supply themselves with gas at 3s. 10d. per 1000 feet, whereas they are now paying 3s. 6d.

Sir E. BECKETT: Supposing we were to offer to engage never to charge them more than a shilling beyond our present price, if that price goes down they would get gas considerably lower than they do now. Would that, do you think, be a liberal offer on our part?

Witness: Yes, I think it would be decidedly a liberal offer; and, if they were wise, they would accept it, inasmuch as if they persist in their attempt to carry this Bill, and succeed in doing so, it will be a bad thing for both parishes. We should never think—speaking for the Corporation—of laying another yard of main if this shilling were taken away from us, and those who might want the gas would want it for ever, because we are not bound to lay down mains.

Have you calculated how much the present price of gas—viz., 3s. 6d.—yields in these places in the way of profit to the Corporation?—It comes to about 6 per cent., which is much less than either of the companies which were bought up in 1875 were authorized to divide, and also much less than the Birmingham Corporation make in any other part of their district of supply. Taking the shilling off would leave scarcely any profit at all, or rather a loss, if the capital employed is to be considered as entitled to any interest whatever.

The CHAIRMAN: I am afraid, under these circumstances, you will lose very heavily upon the other outlying districts which have not that extra shilling?

Witness: No, my lord, there is no loss by them. There is a cluster of places round Birmingham, but this is an outlying district, and very sparsely populated—more so than any other.

Sir E. BECKETT: On the thin part of the district I dare say they do lose.

Witness: They may lose in some districts, but the great bulk of the profit is made up out of the concentrated parts of Birmingham. As a rule, in the other thinly populated districts there is a compensation balance; for example, there are mills and manufactories, consuming a large quantity of gas.

Cross-examined by Mr. O'HARA: In calculating the £600 per million feet, no allowance was made for prospective extensions. The works were taken as they stood, and they were working nearly up to their full capacity' there was not 10 per cent. surplus, if I remember rightly. I am aware that the Corporation supply gas at Olton, but half the expense of the mains was paid by that place, because the Corporation would not go there on any other terms. I lately made an estimate of the West Bromwich portion of the Birmingham Corporation works, and it was at the rate of £600 per million feet. I do not recollect the aggregate amount.

Mr. O'HARA: Was it not £296,000?

Witness: As the value of what?

Of West Bromwich; the value of the entire undertaking of the Swan Village works—mains, meters, and services complete?—That is a different matter altogether. The value of the undertaking is one thing, and the value of the works we are now discussing is quite another. The undertaking may be worth three times as much as the works, and probably would be.

Cross-examination continued: I am aware that in the West Bromwich case the Arbitrator only awarded something like £70,000; but it all depended upon the interpretation of the Act of Parliament as to what the rights, or privileges, or liabilities of the Corporation were in taking over the concern. It had nothing whatever to do with the value of the undertaking, which was determined by us, who valued it for the Corporation, on its own merits, apart from the question of law, which was decided against us. The valuation made by and on behalf of the Corporation was based on the annual profits derived, multiplied by 25. If this Bill passes it would be very unwise to advance the mains any farther in either of these districts, because there would be no profit in extending mains to sell gas at 2s. 6d. per 1000 feet. Supposing Yardley and Northfield to become covered with houses and factories, of course, it would then be worth while to go there, but that will not be the case for a very long time to come. The Corporation have nothing whatever to do with Solihull.

The CHAIRMAN: The Corporation have pierced Yardley with their mains, and reached Solihull; that is what I understand by the evidence.

Sir E. BECKETT: Only to Olton, and that under circumstances previously described.

Re-examined by Sir E. BECKETT: I am aware of the exceptional circumstances with reference to Olton, but I believe the circumstances were rather more favourable to the Corporation than have been mentioned. I think the Corporation—I have this from the Secretary to the department—discovered through one of their officers that they had not the power to charge the higher rate. That was mentioned to the Committee, and they felt that they could not do what was wrong, and, therefore, ordered the price to be reduced; but I do not think it was because of any action by the Olton people. The population of Northfield in 1871 was 4609, and I should not think it has increased much since then, except in the portions nearest Birmingham; but there is nothing one could call compact in any portion of the district.

Sir E. BECKETT: In 1864 the Company were in Parliament—not the Corporation—for adding these districts, but they then had a price of 4s., and it might have been worth while to include those places at that rate?

Witness: There was no risk then as to the concern paying while they had that margin.

And it was the Corporation of Birmingham who came in and insisted on that differential rate, and not the Company?—Yes, in the interests of the consumers of Birmingham.

Besides that, there is another little incident. It is always the interest of a gas company to get out as much capital as they can, without any prospect of paying?—Under the old state of things, that was so, but that is not the case now.

That was one of the reasons urged in 1875 for buying up the Companies, and so putting an end to that?—Yes; it was.

Mr. *Charles Hawksley*, examined by Sir E. BECKETT.

I am in partnership with my father, and am well acquainted with Birmingham. I have lately visited Northfield and Yardley, which are, in a great measure, agricultural districts, excepting the parts near to Birmingham. I have never heard of a Bill of so unusual a character as the one under consideration. Of course, the Committee are perfectly familiar with many applications from consumers for a reduction of rates, but those applications, so far as my knowledge goes, have invariably been made when the parties supplying the article on which the reduction is sought for have been before Parliament with a Bill of their own. My opinion is, that if such a Bill as this is allowed to pass, it will form a precedent for applications to Parliament from all parts of the country; because it follows that, if persons are allowed to introduce Bills for the purpose of simply benefiting themselves, they will have everything to gain if successful, and nothing to lose, beyond the mere expenses, if unsuccessful. They will be applying from all parts of the country for relief from the rates which Parliament has previously sanctioned, and in which large amounts of capital have been invested. Doubtless, they would always find some engineer to come and make out that they can get gas for less, and in many cases possibly it would be true, because the parties now supplying the gas—whether they be corporate bodies or companies—have gone through all the loss of introducing the supply, and have then had to introduce modifications in the mode of manufacture from time to time; but when that has been done, and the business made, it would be very unfair that any new company or local authority should come in and really take advantage of all their goodwill without paying for it. I have made an independent calculation as to what it would cost these people to make gas for themselves, taking each parish separately. In Northfield, I find the cost would be—including the sinking-fund, which is always imposed in these cases—3s. 10d. per 1000 feet, without allowing any profit whatever, or without allowing for any increase in the price of coal, which is almost sure to come. In the parish of Yardley, the cost would be 3s. 11d. per 1000 feet. I have taken the cost of the mains at what it has actually been to the Corporation as stated by Mr. Hack, but have excluded all the trunk mains lying beyond the boundaries of the respective parishes. It would take between 4d. and 5d., in addition to the prices I have mentioned, to pay a dividend of 6 per cent. I have assumed that these local authorities could only borrow their money at 4½ per cent., which is the lowest, I think, at which they could raise it. I think the differential rate ought also to have been applied to King's Norton and Sutton Coldfield; but the Company in 1858 took those places at the same rate as Birmingham, probably it not then being thought worth while to encounter a contest over it, because prior to 1858 there was no limit to the charge which the Company might make. I agree with Mr. Spice that the reduction of the price in this arbitrary way would be a great check upon the Corporation extending the mains. I also think it is somewhat inconsistent that the local authorities—or the consumers who were before them—should have laid by until the mains had been extended over the populated part of the district, and then, when it was too late for the Corporation to withdraw, should come and ask Parliament to reduce the price, those pipes having been laid on the faith of the additional rate of 1s. which Parliament had granted. I think they are also very regardless of their neighbours in the less favoured parts of the district, because it is quite clear that if the 1s. be taken off the price of gas, those people will have much greater difficulties in inducing the Corporation to extend their mains. Another element in the case is that those districts are what is termed residential. There are very few manufactories, and I do not suppose there will be many.

Cross-examined by Mr. O'HARA: I am quite prepared to admit that a valuation in one place is very different from that in another, because the circumstances differ; one may be a manufacturing place and another an agricultural district. As the basis of my calculation for the price of 3s. 10d. I took £600 per million feet for the works and manufacturing plant, and I took the mains at what it has been shown they cost the Corporation, excluding any trunk main outside the parishes.

Sir E. BECKETT, on behalf of the Corporation of Birmingham, said he would at once relieve the minds of the good people of Northfield and Yardley, by saying that there were two allegations in their petition with which his clients were prepared to agree. It was alleged that, at some time or other, the Corporation might charge them 1s. 6d. instead of 1s. over and above the price in the borough of Birmingham. There was no doubt the Corporation had power to do this, but they never had done so; on the contrary, they had voluntarily reduced the price by 6d., and if there was now any apprehension that they had any intention of increasing the rate again, he had no objection to a clause being inserted restricting the differential rate to 1s. Mr. Bramwell, in his evidence, had remarked that the time might come when, upon commercial grounds, it would be expedient to reduce the price with the increased consumption. He agreed with that, because, if there was a large increase in the population of Northfield and Yardley, there would doubtless be a reduction in the price of gas. In the present case the people took gas from the Corporation at a fixed price, and it was unfair for them now to press the Corporation to reduce it, they having been at great expense in laying mains, &c., on the strength of the extra price which was to be paid. The cost of gas in Birmingham depended on the profit made by the Corporation, and if that profit was large the ratepayers would press the Corporation to reduce the price, and then the outlying districts would all receive the benefit of a reduction. There was also another point on which the Corporation were prepared to yield—viz., that the ratepayers of Northfield and Yardley should have the right to purchase the works from the Corporation, so that they could supply their own district. Four other districts had done so, and there was no reason why those places should not do it if they thought they could get gas cheaper. That they had been told publicly and privately, but they first wanted to reduce the rate by the amount of £1000, so that, in round numbers, if they wanted to purchase, the value of the property would be reduced by £25,000. The promoters were in a position in 1875—the time of the purchase of the Staffordshire Company—to appear before Parliament and oppose the arrangement, but they failed to do so. In the language of the Court of Chancery, they laid by while the bargain was being made. Mr. Chamberlain had well said that at the time the Corporation purchased the works, the Staffordshire Company were paying their maximum dividend; but then came the coal famine, and they had had to take nearly all their reserve capital in order to meet their liabilities. Although at that time they were making a bad bargain, they went on, so as to keep faith with those with whom they had agreed to purchase; but, if they had then struck off the extra 1s., the Corporation would have made even a worse bargain, for they would have been £1000 a year worse off. During all that time Northfield had sat still, and did not interfere at all until now, when, jealous of their neighbours of King's Norton getting gas cheaper than they did, they came to Parliament to upset an old existing arrangement. If this differential rate were abolished, the people of Birmingham would actually have to pay for gas supplied to residents beyond the borough boundary. As to the cost of supply, it was absurd to compare the price with Birmingham, for those were agricultural districts, where not one-fourth as much gas was used per mile of main as in the borough. Besides that, it was customary for Parliament to uphold such rates, and in the present case there had been no satisfactory reason assigned why Parliament should depart from their usual course. It was stated that by making gas themselves they could get it cheaper than they did now, but how was that attempted to be proved? Why, by two witnesses, who said the cost of the works would be £20,000,

although it was well known that the Corporation had laid down mains through those districts, which had cost £19,000. Mr. Hawksley had estimated that gas could not be supplied for less than 3s. 10d., and no one had attempted to contradict his evidence, while all those consumers paid was 3s. 6d. It had even been shown that at Solihull the Gas Company only paid 6 per cent., and that they could not supply gas for less than 5s. 10d. With regard to the case of Olton, it was a very exceptional one. In the first place, the residents in that district had agreed to pay half the cost of putting down the mains, and the Corporation consented to these terms thinking they could charge the extra 1s. per 1000 feet. They found, however, they were wrong, and that they could not do so; and it was not right, therefore, to cite that case against them. In short, the promoters case had nothing new about it. It was the old story—people did not like, under any circumstances, right or wrong, to pay more than their neighbours. He would not say that if this Bill passed it would be confiscation; but he would use a stronger term, and say it would be robbery. It was simply taking a thing from one and giving it to another—from those who bought the thing to those who did not; and if Parliament passed the present Bill there would be no limit to applications to abolish differential rates.

Mr. O'Hara, in replying upon the whole case, said that it had been admitted that the Corporation were willing, in 1875, to give the promoters a permissive clause to abate the shilling charge; but Mr. Chamberlain now stated that the Corporation were in favour of retaining that charge, and he actually said that, if the differential rate were abolished, the Corporation would sustain a very great loss. The reason why there was no petition against the Bill of 1875 was because, when the Bill was before Parliament, the petitioners were told that they had no *locus standi*. That partly explained why there was no organized opposition to the Bill of 1875; but the cost of petitioning was also a matter which their lordships would appreciate. The honourable member for Birmingham had said that it would be confiscation to abolish the differential rate; and no doubt he thought the word "confiscation" would be effective with their lordships, remembering that it had been said, "We shall have no confiscation so long as we have a House of Lords." It would not, however, be a matter of spoliation or confiscation, but rather a matter of restitution, if the Corporation abolished the differential rate. The promoters asked for the abolition of that rate as a mere matter of justice. As it was not at all necessary for the Corporation of Birmingham to come to Parliament to obtain power to increase their capital, the promoters had no opportunity of asking Parliament to give them certain concessions such as they asked for in this Bill. The Act of 1875 would never have passed with the differential rate clause if there had been a Lighting Authority in Northfield or Yardley. What was now asked on behalf of the people of those districts was that they should be treated in the same way as the residents in the other outlying districts. If their lordships would look at the map, they would see more eloquently than he could state the grievance of the promoters of the present Bill. It was said that the Corporation incurred great risk in carrying on the gas-works, but it was a mistake to make that assertion, because the undertaking had proved a very profitable one. He therefore asked their lordships to afford the relief which was sought for by the present Bill.

The counsel and parties were then directed to withdraw. On being re-admitted,

The Chairman said the Committee were of opinion that the preamble of the Bill was proved.

The clauses were then read and agreed to, with alterations, and the Chairman was directed to report the Bill to the House.

Monday, July 7.

(*Before Viscount* Hardinge, *Chairman*; *Earl* Hardwicke, *Lord* Forbes, *Lord* Colchester, and *Lord* De Mauley.)

ALLIANCE AND DUBLIN CONSUMERS GAS BILL.

Sir Edmund Beckett, Q.C., Mr. Richards, Q.C., and Mr. Pembroke Stephens appeared for the promoters; and Mr. Michael, Q.C., and Mr. Clifford for certain Consumers of gas in Dublin and its vicinity, who petitioned against the Bill.

Sir Edmund Beckett, in opening the case, said that the object of the Bill was to enable the Alliance and Dublin Consumers Gas Company to construct tramways for the purposes of their undertaking; to define certain powers of the Company; and for other purposes. By the Alliance and Dublin Gas Act, 1866, the Alliance and Dublin Consumers Gas Company and the Commercial Gas Company of Ireland, Limited, were amalgamated, and were authorized to acquire the Dublin undertaking of the United Gas-light and Coke Company. By the Act of 1866 it was, among other things, declared that the Company thereby incorporated by the name of the Alliance and Dublin Consumers Gas Company, should be a company for making and maintaining gas-works, and for making and supplying gas and other improved means of lighting for public and private purposes. The limits within which the Company might supply gas or other improved means of lighting for public and private purposes, and put the Act into execution, were defined. The Company might from time to time purchase or acquire, but only by agreement, any quantity of land, not exceeding in the whole 20 acres, which they required for the purposes of the Act. The Company and the Corporation of Dublin, and any local authorities having the charge of lighting any streets within their limits, might from time to time make, and carry into effect, contracts for the supply by the Company of gas to public and other lights. By the Alliance and Dublin Consumers Gas Act, 1877, the Company were authorized to acquire additional lands at Bray for the purposes of their undertaking, and it was declared that upon, or in respect of such lands and works at Bray, the Company might exercise and enjoy all the rights and privileges conferred upon them by the Acts of 1866, 1871, and 1874. If a short tramway were constructed, for which power was asked in the Bill, the process of the removal of coals would be expedited, and public convenience thereby promoted. The tramways would be a saving to the citizens. The part of the Bill which provoked opposition was that covered by the following words in the preamble:—"Whereas demands have of late arisen for improved methods of lighting, it is expedient that, within the district over which the powers, duties, and obligations of the Company extend, facilities for complying with such demands should be afforded, and that the powers of the Company in relation thereto should be defined." The petition against the Bill was on the part of ratepayers, owners of property, and consumers of gas in the City of Dublin and its vicinity. They set out that under cover of the general words contained in the Act of 1866, and contrary to the intention of Parliament, the Company were endeavouring by the Bill to acquire powers which might hereafter be used for the purpose of supplying light, by means of electricity or otherwise, within their existing gas limits, with a view mainly to secure the control and practical monopoly of the supply of lighting by means of electricity. There had been 19 or 20 Gas Bills brought forward in the present session of Parliament by existing Companies, or by Municipal Corporations, being gas manufacturers; but in the other House of Parliament it was resolved that, before granting powers of this nature, inquiry should be made and evidence taken by a Select Committee, who were still pursuing their investigations. For a considerable time, awaiting the report of this Committee, the further progress of the Bills in question was suspended. The Bill of the Company was among those so dealt with, and the petitioners relied upon the stay of all further proceedings until the other House of Parliament had decided whether, on grounds of public policy, it was expedient to grant to existing companies or corporations these further powers and *quasi* monopoly in respect of public and private lighting by electricity. The petitioners alleged that the Bill still contained words and provisions which would confer upon the Company powers of electric lighting in Dublin and its neighbourhood, should the electric light ever be perfected as a means of improved lighting for public or private use, and they alleged that they would be injuriously affected by the granting of such powers to the Company, and by the creation of a new monopoly in addition to that already enjoyed by the Company. That being the extent of the petition, the question was whether a few consumers of gas were to be allowed *locus standi* to petition against the Bill, which had received the general sanction and approval of by far the majority of the citizens of Dublin. He concluded by expressing a hope that the Committee would not allow the *locus standi* of the petitioners.

Mr. Michael said that Sir Edmund Beckett had not told the Committee whether the Company intended to supply the electric light in future by means of capital raised for other purposes. He maintained that there were increased powers given by this Bill, and argued that the petitioners had *locus standi*. The preamble of the Bill expressly indicated the intention of the promoters: "And whereas demands have of late arisen for improved methods of lighting, and it is expedient that, within the district over which the powers, duties, and obligations of the Company extend, facilities for complying with such demands should be afforded, and that the powers of the Company in relation thereto should be defined." If these powers were granted, then, according to the operation of the Gas-Works Clauses Act, 1847, they would have the power to break up the streets for the purpose of supplying light by electricity. By section 3 of the Bill, the expression "lighting apparatus" meant and included "any engine, machine, lamp, branch, globe, shade, candle, or other implement or contrivance, or any fittings used or connected therewith." These were matters expressly put in for the purpose of supplying electric light. Section 41 drovided like facilities for the supply of gas and other means of lighting. It was as follows:—"For the purposes of, and in connection with the manufacture, development, distribution, sale, or supply of gas, or other improved means of lighting by this Act authorized, the Company shall possess, and may exercise similar powers in all respects in which the same can or may be exercised, or made applicable to the powers which they possess, or may exercise, for the purposes of, or in connection with the manufacture, development, distribution, sale, or supply of gas under the former Acts, or any of them, or otherwise, and subject to the express provisions of the former Acts and this Act, and to all modifications, qualifications, or restrictions existing or affecting the same, all the rights, powers, privileges, and authorities of the Company shall accordingly be good, valid, and effectual, *mutatis mutandis*, in either case." Were there any "improved means of lighting by this Act authorized"? If so, they were not included in the Act of 1866. Clause 42 said: "The Company shall not, without the consent, in writing, of Her Majesty's Postmaster-General for the time being, alter or interfere with, either permanently or temporarily, any telegraphic line (within the meaning of the Telegraph Act, 1878) of the said Postmaster-General, or place any part of any wire of the Company within 6 feet of any such telegraphic line." Did not all these sections point to the intention of the promoters to supply electric light?

Sir E. Beckett: I contend that we have the power.

Mr. Michael said that in the other House Mr. Richards stated that there was nothing in the Bill touching the electric light, but here was a Bill which was to enable the promoters to introduce the electric light.

Sir E. Beckett: I do not say the Bill is for this purpose, but we want power in order to raise money.

Mr. Michael said he complained of this on the part of the consumers. Under the powers of the Gas-Works Clauses Act, 1847, when the profits of the Company were sufficient to pay a maximum dividend, and there was a reserve-fund, the Company were obliged to reduce the price of gas, but if they obtained the money powers asked for, an indefinite time would elapse before any reduction would take place. He urged that the promoters should strike out of the Bill all that related, directly or indirectly, to the electric light. He submitted that, as representing some large consumers of gas in Dublin, he had a right to be heard upon their petition, as they objected to any experiments being made by means of electric light. The Citizens Committee was formed in 1874 for the express purpose of watching over any Bill that was introduced by the Company into the House of Commons. The Secretary of the Committee was Mr. J. M'Evoy, and it represented a large number of ratepayers. The petition ran thus: "The humble petition of the several persons whose names are hereunto subscribed, being respectively ratepayers, owners of property, and consumers of gas in the city of Dublin and its vicinity, petitioning on their own behalf, and on behalf of the general body of consumers within the limits of the promoters Act."

The Chairman: Were these gentlemen granted *locus standi* in 1874?

Mr. Michael said that in 1874 he represented certain of these gentlemen in opposition to the Company's Bill.

The Chairman: Why did not these gentlemen petition in the House of Commons?

Mr. Michael said in that case the Dublin Corporation appeared, and they thought their interests were sufficiently protected, but now they petitioned as they believed the Bill was to authorize electric lighting. He claimed on behalf of the citizens of Dublin their right now to be heard, because the Bill interfered with existing legislation, and it would affect the consumers. It gave power to the Company to dig up streets, to acquire additional land, and to obtain certain additional powers.

Mr. Richards said that when the Bill was before the House of Commons the Corporation of Dublin presented a petition, which was examined by the promoters, in conjunction with Mr. Raikes, the Chairman of Committees, and a certain agreement was arrived at with the Corporation, who were so entirely satisfied with the compromise that they permitted the Lord Mayor of Dublin to go into the witness-box and express his satisfaction with the Bill as it then stood. If they were not satisfied, they could have presented a petition to the House of Lords; but they had not done so. The Corporation of Dublin had agreed to the Bill, the promoters of which said that the Corporation were the proper representatives of the consumers of gas in Dublin. The petitioners were 29 consumers. The Committee could not put their finger upon one single line of the Bill and say it affected the rights of any individual. Clause 28 was added to the Bill, in the other House, by the Speaker's Counsel, and was as follows:—"The Company may, in addition to the powers possessed by them under their Act of 1866 and other Acts, have and exercise all or any of the powers, and all or any of the things following, that is to say:—The manufacturing, purchasing, hiring, letting to hire, and supplying of meters, stoves, fittings, machinery, engines, and apparatus, for the purposes of lighting, heating, and cooking, and all other purposes whatever, by means of gas, or by any

other means of lighting or heating authorized by the said Acts or any of them."

The CHAIRMAN: The question is whether a certain number of ratepayers have any right to appear.

Mr. RICHARDS said that his friend Mr. Michael had gone into the merits of the case, and, therefore, he must beg to be excused from so doing. He contended that, *primâ facie*, the Corporation represented the ratepayers.

The CHAIRMAN: If a certain number of ratepayers meet, and say they are dissatisfied, are they justified in appearing to oppose the Bill?

Mr. RICHARDS thought that it should be shown who were the ratepayers, and in what proportion they were to the gas consumers of Dublin. This petition was signed by only 29 persons.

The CHAIRMAN: Is it not alleged that they are a committee to represent the whole body of consumers?

Mr. MICHAEL: Look at paragraph 18 of the petition, which states that "on their own behalf, and on that of the general body of consumers of artificial light within the city of Dublin and the neighbourhood, your petitioners allege that the grant of such extended powers, and the establishment thereby of a new monopoly, or *quasi* monopoly, with regard to the supply of artificial light, would be greatly to their injury, and against the interests of the citizens of Dublin and other residents within the gas limits of the Company."

The CHAIRMAN: Can it be shown that there has been any public meeting held on the subject?

Mr. CLIFFORD said he could show that meetings were held, representing the consumers of gas.

The CHAIRMAN: Can you show that the petitioners are a committee representing a large body of ratepayers?

Mr. CLIFFORD: We are prepared to show that.

Mr. RICHARDS submitted that it would be a dangerous precedent to grant the petitioners *locus standi*.

The CHAIRMAN: Supposing they could say there was a meeting held on this subject?

Mr. RICHARDS: If you think it necessary to show that public meetings of citizens were called, and that certain resolutions were come to sufficient to set aside the legitimate agents, of course I cannot object.

The CHAIRMAN: But what about 1874?

Mr. RICHARDS: In that year there was a large representative public meeting on the subject, and the resolution, it was stated, was adopted at a public meeting of consumers.

The CHAIRMAN: It appears certain that a number of ratepayers are dissatisfied with the compromise between the Corporation and the Company. The question is, can you show that a large number of ratepayers were dissatisfied and had a right to object?

Mr. MICHAEL: A committee was appointed to watch over the interests of the ratepayers. I can call Sir Arthur Guinness to show the constitution of the Committee.

Mr. RICHARDS submitted that it was not a case for evidence. The Committee were in possession of all the facts.

The CHAIRMAN: Sir Arthur Guinness is not a petitioner.

Mr. MICHAEL: I thought it better that an independent witness should be called to speak as to the status of the petitioning Committee.

After some further discussion, the room was cleared, and the Committee deliberated a few minutes. Upon the re-admission of the public,

The CHAIRMAN said: The Committee have decided that the petitioners have no *locus standi*.

[The Bill, as unopposed, afterwards came before Earl Redesdale, and the preamble having been proved, it was reported to the House.]

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

FRIDAY, JULY 18.

(*Before the* MASTER OF THE ROLLS.)

ATTORNEY-GENERAL *v.* THE LOWER THAMES VALLEY MAIN SEWERAGE BOARD.

This was a motion to restrain the individual members, treasurer, officers, or others connected with the Board from applying any moneys out of the common fund already contributed, or to be contributed by the several authorities comprised within the district called the Lower Thames Valley Main Sewerage District, in payment of the costs of the introduction of a Bill in Parliament, entitled "A Bill to extend the powers of the Lower Thames Valley Main Sewerage Board," or towards the expenses of any late opponent of the Bill. The defendants were constituted by a Provisional Order in 1877, and certain districts therein mentioned were formed into a united district for the purpose of making a main sewer for the use of the constituent district. This Order was subsequently confirmed by Act of Parliament, and by the Order it was provided that the expenses incurred by the Board in carrying out their duties under the Order might be taken out of the common fund raised by the different districts. It was now alleged that the Board, instead of carrying out the purposes for which the united district was formed, had, without the sanction of the Local Government Board, determined upon a new plan for dealing with the sewage of the district, and it was said that in carrying out this new plan they had incurred various costs and expenses not within the provisions of the Order; that they had promoted a Bill to extend their powers, which was thrown out in the House of Commons on second reading; and had paid the expenses incident to promoting this Bill out of their common fund. This information was commenced by the Attorney-General, on the relation of some of the ratepayers of the united district, to restrain the Board from applying any portion of the joint fund otherwise than according to the provisions of the Order.

Mr. CHITTY, Q.C., Mr. MACNAGHTEN, and Mr. F. VERNEY appeared for the plaintiff; Mr. INCE, Q.C., and Mr. PUGH for the defendants.

Mr. CHITTY, in support of the motion, said that the statement of claim filed in this case stated in paragraph 9 that, since the Bill had been thrown out, no less a sum than £6730 would be required for the various additional expenses of the Board. At the relation of certain of the ratepayers within the district over which the Board were the Sanitary Authority, the Attorney-General was moved to interfere to prevent the Board from diverting the funds entrusted to them for carrying out the purposes for which they were formed to the payment of parliamentary expenses. He submitted that the Board were not authorized to spend money in obtaining an Act of Parliament. They were the governing body, and, notwithstanding the protests of some of the ratepayers on several occasions, they had determined not to execute the duties imposed upon them by the Acts of Parliament already mentioned; but had sought to obtain the sanction of Parliament to an aggressive scheme in the shape of a Bill which had been lately thrown out. The defence attempted to be set up was of a marvellous kind. The defendants said practically that they were wiser than Parliament; that the Acts already in existence were not sufficient for their purpose; and that therefore they were determined to apply for an extension of their powers.

Mr. INCE submitted that there was no case for an injunction. Under the Provisional Order of the Local Government Board, the Board were authorized to do certain drainage works, &c., within a period of three years, or be held to be in default under the Public Health Act. The three years would expire next year. The Board obtained the best plans, and, after making a selection, they found that they could not carry them out unless they had compulsory powers to take land for their irrigation works. The gentleman who was mainly instrumental in setting the Attorney-General in motion, not liking to have the proposed irrigation works right under his nose, opposed the Bill, and it was thrown out. The present case differed from all those with which his lordship was familiar, in which corporations had done something outside the scope of their duties, because here was a corporation doing that which, under the very terms of the Provisional Order, they were bound to do. They were bound to carry out the main drainage scheme, and they were bound for that purpose to take the land they required.

The MASTER of the ROLLS: There is an overwhelming *primâ facie* case against you. First of all, you have no right to go to Parliament for an Act; and, secondly, you did not present a proper Bill.

Mr. INCE said his clients were anxious to have his lordship's opinion, and he would argue the legal question at once. He submitted that the Board were trustees for particular purposes, and that they were bound to apply the money entrusted to them to carry out those purposes.

The MASTER of the ROLLS, in giving judgment, said that first of all he had to consider the cases that bore on the subject, some reported and some un-reported; and what they established was that where funds were entrusted by Parliament to a public body for a definite purpose, the Attorney-General was entitled to restrain that body from applying those funds to another purpose. They also established a second proposition, that where the definite purpose was the execution of a work, such as the making of drainage works, whether in an agricultural district or in the district of a town authority, or for the purpose of making highways, docks, or works of that kind, the public body were not entitled to use those funds in applying to Parliament for an extension of their powers. That was not considered to be a purpose incidental to the main purpose defined by their Act. This being so, he thought there would be no difficulty in applying the principle to the case before him. The body he had to deal with was undoubtedly a public body, formed for the purpose of draining the district. The purposes for which it was created were clearly defined by the Act of Parliament under which it was formed. He had, therefore, only to see whether or not among the purposes defined was the power to apply to Parliament for an extension of power. Now the purposes for which this united district was formed were the following:—To make and maintain a main sewer or sewers, to erect machinery, to work such machinery and plant as might be required for conveying the sewage of the united district to a convenient place or places, where it might be purified, if necessary, by application to the land, or in such manner as that it might be discharged into any river or watercourse free from all pollution. The duty of the Joint Board was to carry out these works within a period of three years from the commencement of their Order, and in default of so doing they were to be deemed a local authority in default, under the provisions of the Public Health Act, 1875. Now they could not carry out a duty of law without the means of performing it. It could not be a man's duty or a board's duty to do that which was impossible. Consequently, when the Act of Parliament said "it shall be their duty," that showed on the face of it that means were provided by the Legislature, or were to be provided, for doing that which was called a duty. That being so, the next thing he had to do was to see whether the argument was well founded, that there were no means provided for obtaining land without application to Parliament; and not only did he find that the argument was not well founded, but he found express clauses showing how the land was to be provided. The 12th section of the Order incorporated sections 175 and 176 of the Public Health Act, 1875. This section gave power to local authorities to purchase land within or without their district; but before a local authority could take land compulsorily, they must obtain a Provisional Order from the Local Government Board under sec. 176, which Order must be submitted in a Confirmation Bill to Parliament. So that the machinery provided for acquiring land compulsorily was that they must get an Order from the Local Government Board. He assumed that the Board would grant an Order whenever it was necessary, because otherwise the purposes of the Act could not be carried out. Parliament had sufficient confidence in the Local Government Board to know that it would do its duty, and would not only issue the Provisional Order, but would submit it to Parliament. Therefore the Joint Board must first of all get a Provisional Order, and then leave it to the Local Government Board to carry that Order through Parliament. There was no power conferred on local authorities to give the go-by to all the provisions of the Acts of Parliament, and start on their own account with an entirely new Bill, giving them authority not only to take land, but to do a great many other things without the previous sanction of the Local Government Board, and without that previous investigation which the Act held to be a proper condition to going to Parliament at all, and without the assistance of the Local Government Board in carrying through Parliament any confirmation of a Provisional Order. That being so, it seemed to him that the action of the Joint Board was not only not authorized by, but was entirely opposed to the Acts of Parliament, and the Bill having been thrown out showed that the opinion of Parliament was opposed to the scheme which the Board had brought forward. Under these circumstances, he said they were liable for this expenditure, and that the injunction ought to be granted.

Mr. CHITTY asked if the injunction applied to precepts that were out for the £7000.

The MASTER of the ROLLS said he would not go into facts; he simply restrained the Joint Board from taking any proceedings for obtaining money for the purpose of defraying the expenses of their application to Parliament.

Order accordingly.

SATURDAY, JULY 12.

(*Before Vice-Chancellor* BACON.)

HESKETT *v.* THE BOLTON GUARDIANS.

This was an action to restrain the Guardians of the Poor for the District of Bolton from draining the workhouse in such a manner as to be a nuisance to the plaintiff. The case was heard before the Vice-Chancellor on the 29th of May (see JOURNAL, Vol. xxxiii., p. 895), on a motion for an injunction, but was ordered to stand over to enable defendants to file affidavits. It now came before his lordship as a short cause, the parties having agreed to settle the action.

Sir HENRY JACKSON, Q.C., and Mr. BYRNE appeared for the plaintiff; Mr. MILLAR was for the defendants.

Sir H. JACKSON said the action at one time promised to be a very hostile one, but the parties had now met, and the case being practically undefended, the defendants did not intend to contest it further. The minutes which had been prepared included a perpetual injunction to restrain the defendants from permitting the sewage of the workhouse to flow into plaintiff's reservoirs, an agreed sum as damages, and the costs as between solicitor and client. The defendants wished to have the words "to the injury of the plaintiff" inserted in the order, and to this he did not object.

A short time previously a motion for an injunction was made, which the defendants, for some reason or other, wanted to have dismissed with costs; but an injunction was granted, and a day named for the speedy hearing of the action, the question of costs being reserved. He now asked that the costs might be included in the present order.

Mr. MILLAR said he could not consent to any variation in the minutes without the consent of his clients. The minutes as agreed to provided that the "costs of the plaintiff, up to and including the hearing, be taxed and paid."

The VICE-CHANCELLOR said the order must of necessity include the costs of the motion for injunction. His interpretation of the words which had been agreed to was that the costs of the motion were included; but, in order to make it quite clear, he would insert the words "including the costs of the injunction." The motion being part of the action, he had no hesitation in adding those words, and therefore that would be done.

SATURDAY, JULY 19.

Re THE ELECTRIC LIGHTING COMPANY, LIMITED.

This was a petition presented by a creditor for the compulsory winding up of the Company, the objects for which it was promoted having been virtually abandoned. The petition had stood over for some time in order to enable the Company to consider its position, and a resolution had been passed to wind up voluntarily.

The petitioner not pressing for the compulsory order, his LORDSHIP consented to the Company being wound up voluntarily, under the supervision of the Court.

LAMBETH POLICE COURT.—THURSDAY, JULY 17.
(*Before Mr.* ELLISON.)

OBSTRUCTING AN OFFICER OF A GAS COMPANY.

Martin W. Lovelock, of 39, Cottage Grove, Lambeth, appeared in answer to a summons taken out by Mr. Alfred S. Allen, Chief Inspector of the Phœnix Gas Company, for unlawfully refusing to allow a duly authorized officer of the Company to inspect a gas-meter. He was further summoned for assaulting the officer.

Mr. ALLEN attended in support of the summons. Mr. W. H. FULLAGER appeared for the defendant.

Mr. ALLEN stated that the summons had been taken out under the 21st section of the Gas-Works Clauses Act, 1871, by which defendant had rendered himself liable to a penalty of £5. There was no desire to press the case, but the Company wished to show that officers in the execution of their duty were not to be submitted to such treatment as one had received at the hands of defendant.

Mr. ELLISON said he was satisfied that the time the officer went to the house was a reasonable one, and that defendant, acting no doubt hastily, offended as mentioned. He would, however, take into consideration the fact of the Company not wishing to press the case, and only order him to pay a fine of 5s. and costs.

SHEFFIELD POLICE COURT.—FRIDAY, JULY 11.
(*Before Mr.* E. M. E. WELBY, *the Stipendiary.*)

THE SUPPLY OF WATER TO GARDEN PLOTS.

Mr. *A. S. O. Birch*, of 25, William Street, Sheffield, was summoned, at the instance of the Sheffield Water-Works Company, for two quarters water-rates.

Mr. NICHOLSON appeared for the Company.

The *Defendant* said the rent of his house, including a small garden plot, was £17 a year, and the only matter of dispute he had with the Company was the charging of 3s. 4d. per annum as garden water-rate, in addition to the house-rate. He did not think he should be charged 10d. a quarter for such a small garden plot as his was, and he asked the Stipendiary to order the Company to return to him all the money he had paid to them in past years in the name of "garden water-rates."

It appeared from a measurement handed in by the defendant that the extent of the garden "under culture" was 4 perches.

For the Company it was stated that their minimum charge in respect to gardens was for 10 perches at 4d. a perch; but that they did not levy a less sum than 3s. 4d. a year.

The *Defendant* then asked if the Company had any law for "the 10 perches."

The STIPENDIARY said that there were two courses open to him; he could either come to an understanding with the Company to pay the minimum charge of 3s. 4d., or get them to put a meter in.

Mr. NICHOLSON said that a meter would cost 8s. a year. He explained the mode of charging adopted by the Company, and said that if a garden was only 2 perches in extent, the water was charged for the same as for 10 perches.

The STIPENDIARY referred to the Acts of Parliament regulating the charges of the Company—viz., the Water-Works Clauses Acts of 1847, 1853, and 1863. He said that the first and third of these Acts were applicable to Mr. Birch's case, and the mode of assessing laid down was so much per 1000 gallons—10d. per 1000 gallons from 100,000 to 500,000 gallons; 9d. per 1000 gallons from 500,000 to 1,000,000 gallons per annum; and so on. As the two sums of 10d. included in the defendant's rates for the last two quarters were not assessed for according to the Company's Act, which required a meter, he must hold that they had not been properly laid on. By section 12 of the Act of 1863 the Company were empowered to make an extra charge for gardens. But as it was represented for them that it was for the benefit of occupants of small garden plots to be charged at the minimum rate of 3s. 4d. a year, instead of by the gallon, which would involve the expense of a meter, and as no meter had been provided, and the number of gallons consumed in this case could not be ascertained, he would have to dismiss the summons as regarded the sum of 1s. 8d.

The case was, however, adjourned for seven days, to allow the defendant time to consider what course he would adopt.

FRIDAY, JULY 18.

On the case being called on,

The *Defendant* asked that the summons might be dismissed, remarking that he had paid up except the two quarters in dispute. He had protested time after time against the charge, and it was only this time that he was supplied with any information.

Mr. BARKER said that the defendant was told of the arrangement in 1877, that he accepted it, and paid for the water until the two quarters in dispute, so that he could scarcely turn round now and say there was no agreement.

The STIPENDIARY said he must have evidence of some agreement.

Mr. *W. M. Hobbis*, one of the servants of the Company, was then called, and said that on June 16, 1877, he saw the defendant in respect to the water-rate. He wished to know how it was he had been charged 5s. 10d. per quarter, and witness told him the sum was made up of 5s. for the house water-rate, and 10d. for the garden plot. The defendant asked if the Company had a right to charge that amount, and witness said he could not discuss that question with him. The 10d. per quarter was the lowest amount charged. The defendant paid the rate after that statement had been made, and continued to pay up to Christmas, 1878. Witness did not take it that the defendant paid the rate under protest. He had left demand notes for the rate with the defendant for two quarters, and as he would not pay he referred him to the Company's offices.

Mr. *F. J. Dickinson* said the defendant called at the Company's offices at the end of June this year, and asked whether his neighbours paid the garden water-rent, but witness declined to give him any information about other people's rates, and, saying it was a swindle, he left the office in a violent temper.

The STIPENDIARY said it seemed that the defendant had acquiesced in the rate.

The *Defendant* said he had paid it, but protested verbally.

The STIPENDIARY said if he wished to protest he should have sent his protest in writing to the Company, and not made it to one of the clerks. He must decide that defendant had given consent, and had acquiesced in the arrangement; therefore must pay the amount due. If he wished to change the arrangement, he must communicate with the Company.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

Dr. Whitmore's Annual Report to the Vestry of St. Marylebone, which was published last week, stated that during 1878, the mean illuminating power of the gas supplied to the parish from the Fulham works of The Gaslight and Coke Company, when consumed in Sugg's standard Argand burner, at the rate of 5 cubic feet per hour, was equal in intensity to the light produced by 16·80 sperm candles of six to the pound, and consumed at the rate of 120 grains each per hour. The highest mean illuminating power during the year was equal to that produced by 17·40 candles, and the mean lowest to that produced by 16·26 candles. The months in the year during which the mean illuminating power was highest were July, September, and October, when it exceeded 17 candles; the months in which it was lowest were January, February, March, and December. The mean quantity of sulphur in 100 cubic feet of this gas during the year was 15·80 grains, and of ammonia less than half a grain. The gas supplied from the works at Beckton and Bow gave a mean illuminating power equal to 16·85 sperm candles. In three months of the year—July, September, and October—it exceeded 17 candles, and on no occasion was the mean of any month below the legal standard of 16 candles. The mean quantity of sulphur for the year was 12·66 grains, and of ammonia about one-third of a grain. The cannel gas, supplied from the Pimlico works, gave a mean illuminating power equal to about 21 candles, or one candle in excess of the legal standard. The mean highest illuminating power was about 22 candles, while in July it reached within a tenth of 24 candles. The quantity of sulphur showed a mean of 14·55 grains, and of ammonia less than half a grain. As regards pressure, the gas supplied from Fulham was the least satisfactory, the day pressure being at times exceedingly low; whilst that supplied from Beckton and Bow was invariably good, never falling below 16-10ths of an inch, and rising in the evening, when most in consumption, to nearly 40-10ths. The pressure of the cannel gas was on all occasions satisfactory. Daily testings were made for sulphuretted hydrogen, but on no single occasion was any trace of this impurity detected.

ALTERATIONS IN THE TESTING-PLACES.—At the meeting of the Metropolitan Board of Works last Friday, a report was submitted by the Special Purposes and Sanitary Committee, with reference to the letter from the Board of Trade, as to the question of the difficulties which attend the working of the law respecting the places for testing gas, and the recovery of the penalties incurred by certain of the Companies in cases where the gas is defective in quality or pressure. The Board of Trade suggested that the Corporation of the City of London and the Board might confer as to the expediency of giving notices for the introduction of a Bill next session for effecting the necessary alterations in the law; and stated that, should the suggestion be adopted, they will be prepared to give all reasonable aid in furthering the object in view. The Committee recommended that the subject be referred back to them, with authority to confer with the Corporation of London thereon. This was agreed to.

METROPOLIS WATER SUPPLY.

THE METROPOLITAN BOARD'S (WATER EXPENSES) INDEMNITY BILL.

The following, which Sir J. M'Garel Hogg has given notice to move as a schedule to the Metropolitan Board of Works (Water Expenses) Bill, is a statement of the costs incurred by the Board in the preparation of their unsuccessful Bills in reference to the water supply of London:—

Details of Amounts paid or payable by the Board in the years 1878 *and* 1879 *for expenses in relation to the Water Supply of the Metropolis.*

Amount paid in the year 1878. (*Disallowed by the Auditor.*)

Counsel	£1,045	15	0
Engineers (*re* house-fittings and as witnesses)	105	0	0
Chemists (analysis of water and as witnesses)	1,438	6	0
District surveyors (information as to levels of basements, &c.)	257	5	0
Parliamentary agents	1,378	3	7
Lithography, maps, plans, &c.	416	6	1
Shorthand notes	29	15	10
Wages and travelling expenses of assistants	827	14	10
Advertisements	1,105	11	10
Incidental expenses	7	5	9
		£6,611	3 11

Amount paid or payable in the year 1879.
Paid to June 30, 1879.

Engineers (*re* new works and purchase of existing works, and as witnesses)	£6,320	7	8
Geologists (*re* geological formation of places from which samples of water were taken)	348	4	10
Chemists (analysis of water and as witnesses)	276	10	0
Surveyors (information as to levels of basements, &c.)	20	16	0
Travelling expenses of assistants	16	0	0
Advertisements	53	15	0
	£7,035	13	6
Estimated amount to meet outstanding accounts and liabilities	1,500	0	0
		8,535	13 6
		£15,146	17 5

The Registrar-General publishes the following table of the average daily quantity of water supplied to London during June, 1879. According to the returns furnished to him by the Metropolitan Water Companies, 134,725,109 gallons, or 612,118 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight), were supplied daily; or 239·3 gallons (108·7 decalitres), rather more than a *ton* by weight, to each house, and 33·7 gallons (15·3 decalitres) to each person, against 33·6 gallons during June, 1878.

Companies.	Number of Houses, &c., supplied in June, 1878.	June, 1879.	Aver. Daily Supply of Water in Gallons* during June, 1878.	June, 1879.
Total supply	545,040	563,097	130,142,204	134,725,109
From Thames	257,916	269,370	65,215,281	70,080,369
„ Lea and from other Sources	287,124	293,727	64,926,923	64,644,740
Thames.				
Chelsea	29,014	29,700	8,726,500	8,655,800
West Middlesex	50,766	52,332	10,571,009	11,033,588
Southwark and Vauxhall	80,785	86,309	19,400,000	24,029,174
Grand Junction	38,462	39,648	12,698,372	12,493,807
Lambeth	58,889	61,381	13,819,400	13,668,000
Lea and other Sources.				
New River	126,725	128,213	28,461,000	27,394,000
East London	115,143	118,910	28,120,970	29,041,000
Kent	45,256	46,604	8,344,953	8,209,740

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for June, 1879, as compared with that for the corresponding month of 1878, shows an increase of 18,057 houses, and of 4,582,905 gallons of water supplied daily.

The following is Dr. Frankland's report on his analyses of the Metropolitan Water Supply during June, 1879:—

"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending Dec., 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was—Colne Valley, 1·2; Tottenham, 1·5; Kent, 1·6; Chelsea, 2·7; Lambeth, 3·5; East London, 3·6; New River, 3·7; Grand Junction, 5·8; West Middlesex, 7·8; Southwark, 8·6. The Thames water delivered by the West Middlesex, Southwark, and Grand Junction Companies was so much polluted by organic matter as to be quite unfit for dietetic purposes. The first-named Company delivered inefficiently filtered water containing moving organisms. The Chelsea and Lambeth Companies, drawing their supplies from the same source, sent out water of much better quality; that of the Chelsea Company, however, was inefficiently filtered and contained moving organisms. The Lea water distributed by the New River and East London Companies was slightly inferior to that of the Chelsea and Lambeth Companies, but it was efficiently filtered. The deep-well water delivered by the Kent and Colne Valley Companies and by the Tottenham Local Board of Health was bright and of its usual excellent quality for dietetic purposes. The Colne Valley Company's water was also soft, and therefore well adapted for washing. Seen through a stratum 2 feet deep, the waters presented the following appearances:—Kent, Colne Valley, and Tottenham, clear and colourless; Lambeth, East London, and New River, clear and pale yellow; Chelsea, slightly turbid and pale yellow; West Middlesex, slightly turbid and yellow; Southwark and Grand Junction, clear and yellow."

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Matters.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen, as Nitrates and Nitrites.	Total combined Nitrogen.	Chlorine.	Total Hardness.
Inner Circle.								
Thames—								
Chelsea	23·82	·137	·023	0	·170	·193	1·5	18·3
West Middlesex	25·78	·419	·050	0	·155	·205	1·3	18·8
Southwark	25·59	·445	·063	0	·147	·210	1·4	18·3
Grand Junction	25·78	·301	·044	0	·156	·200	1·5	18·0
Lambeth	27·80	·173	·036	0	·195	·231	1·6	18·3
Lea—								
New River	28·26	·194	·035	0	·221	·256	1·4	19·0
East London	27·32	·184	·030	0	·147	·177	1·7	18·0
Deep wells—Kent	45·70	·086	·011	0	·513	·526	2·6	28·5
Outer Circle.								
Colne Valley	12·74	·053	·016	0	·366	·382	1·5	5·3
Tottenham Local Board	43·38	·076	·015	·001	·026	·042	3·0	26·5
Corporation of Birmingham*	22·36	·245	·047	·004	·165	·215	1·6	14·2
Corporation of Glasgow†	2·94	·136	·016	0	·007	·023	0·63	0·95

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
† Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

EUROPEAN GAS COMPANY, LIMITED.

The Annual General Meeting of the above Company was held at the London Offices, 11, Austin Friars, on Wednesday, the 16th inst.—William White, Esq., in the chair.

The Secretary (Mr. Henry Dozell) read the notice convening the meeting, the report of the Directors, and the statement of accounts. The report was as follows:—

The accounts of the past financial year, now submitted to this meeting, show that a considerable improvement has been realized in the affairs of the Company, which continue to be affected, to a limited extent only, by the unfavourable circumstances that have weighed for a long time on various branches of trade in all countries.

On March 31, 1878, the total net profits at the stations were £59,666 3s. 6d.; on the 31st of March last, £62,007 2s. 7d.; increase on the year, £2340 19s. 1d.

Satisfactory as this result appears, it would have been still more so, but for several charges operating adversely on the returns. The rate of exchange between England and France unfortunately ruled high during those months when the largest remittances to this country had to be made, and extra expense was thereby incurred. The reduction in the value of coke produced for sale during the year is equivalent to a sum of £2578, and although this has been compensated in some degree by the lower cost of coals, yet a considerable balance remained uncovered on the 31st of March. The expenses for insurance, superannuation, income-tax, depreciation, and sundry other items of less importance, have also been more considerable than in the previous year.

On the other hand, the gas-rental for the year shows an improvement of 5 per cent.

Of the extensions previously reported to be in progress, some are nearly completed. The Boulogne gasholders will soon be delivered over to the Company. The tank at Nantes has been begun, and preliminary steps have been taken for the erection of auxiliary works at Sotteville, near Rouen.

The new retort-house at Havre is finished, and a sufficient number of settings are being fitted up therein for pressing requirements; but that at Boulogne has not yet been commenced, and an effort is being made to further defer the intended outlay.

The additional purifying-house, new purifiers, scrubbers, and other apparatus required at Nantes for next winter's service are in course of completion.

At Bolbec an agreement has been entered into for telescoping one of the gasholders, which is now in the contractor's hands for that purpose.

All the stations will thus be placed in readiness not only to meet the immediate demand for gas, but to provide for the increase which may reasonably be expected when greater activity in trade and more complete confidence in existing political institutions shall prevail.

At Bolbec an extension of the Company's exclusive privilege has been obtained, on terms which are admitted to be satisfactory to the Municipality and private consumers, and at the same time conducive to the best interests of this undertaking. The concession, thus modified, will not expire until April 30, 1906, and the whole of the land, works, and mains will then remain the property of the Company. The Directors venture to anticipate that the effect of the reduction of price, which was the principal means of securing this result, will soon be fully compensated by increased consumption of gas.

Experiments having been made at Havre, with the view of employing electricity for lighting the entrance to the port and docks, this Company, being ably assisted by the great ingenuity of their Manager at that station, M. Gautier, have adapted for the purpose a new gas-burner of considerable power, which has been for several months successfully brought into competition with the lighting by electricity, and has been highly appreciated by the authorities, who have discontinued the electric light.

The sensation produced some time ago by alleged improvements in practical modes of lighting appears to be gradually dying out in France, as in this country and elsewhere.

The Shareholders were informed, at the last half-yearly meeting, that a sufficient supply of coals for the next twelve months had been provided on advantageous terms. Freights have since been secured on conditions equally favourable, and, to meet the possible danger and inconvenience of renewed strikes in the English coal districts, arrangements have been entered into for supplying the stations with French coals of fairly good quality, should such be required.

On reviewing the present state of the works of the Company, and the capabilities of the seven stations, together with the probability of a largely increased demand for gas, arising out of the desire generally expressed for more light, the Directors feel they are justified in maintaining their confident opinion that the basis on which this Company is established is such a substantial one as to hold out the promise of a prosperous future. They therefore recommend the declaration of a dividend at the same rate as that paid last year—namely, 21s. per share on the paid-up shares, and in proportion on those only partially called, free of income-tax; leaving a balance of £2720 17s. 11d. to be added to the reserve of undivided profits.

Debentures bearing interest at 5 and 4½ per cent., to the amount of £9200, became due on the 1st inst., and were paid off, with the exception of £3500 renewed at 4 per cent. for a term of years.

Notice has been given that two of your Directors—Henry M'Lauchlan Backler, Esq., and Henry John Baddeley, Esq.—and both Auditors—George Harrison, Esq., and Edward Garey, Esq.—retire from office at this meeting; but, being eligible, will be proposed for re-election.

The Chairman, in moving the adoption of the report, said: Gentlemen, In the report just read we have placed before you a statement of the present position of the Company, coupled with our own opinion, so far as we are able to form one, of its prospects. We cannot lay claim to be a very sanguine Board. We take all the circumstances, both for and against our prosperity, into account, and we give you the result of our knowledge, which, to my mind, affords a cheerful view of our future prospects. Passing in review the operations of the Company for the past year, I have to particularly call your attention to the disadvantages under which we have laboured with regard to the sale of coke, owing to the low price of fuel at our different stations. It is true that we have laid in our coals on very good terms; but, much to our disappointment, this has been of little avail when we consider the value of the coke produced therefrom. It is satisfactory, however, to reflect that favourable contracts for coals and freights have been secured for some time forward, and that coke has been more readily disposed of at the present low prices; so that the necessity for a further reduction is hardly likely to occur. We have done fairly well at all our stations, taken in the aggregate; but, of course, these are not times when any great increase of business is likely to take place. The International Exhibition drew vast numbers of people to Paris during six months of last year, and much of the money was spent there which might otherwise have been expended in the provinces, to the benefit of local interests, including our own. This applies more or less to all the stations, but specially to Boulogne. You will have seen by the report that whilst avoiding as much as possible the outlay of capital, we are keeping the works in excellent order; and well prepared to provide for the additional demand for gas, of which indications are already appearing. You will have heard with satisfaction that we have succeeded in obtaining an extension of our Bolbec concession. There are so many speculating adventurers abroad at the present time, who do not scruple to attack existing gas interests, even with little prospect of benefit to themselves, that the renewal or extension of old concessions is exceedingly difficult. However, when we purchased this station, with only nineteen years to run, we determined that an extension must be obtained sooner or later; therefore, we may fairly congratulate you and ourselves on having succeeded so soon. The value of the station is thereby materially increased, and I may add that although the results have not yet reached the full development we are entitled to expect, they show that the purchase is fully justified by the advantages derived from it. The electric light has made its appearance in several of our towns, but not with any such success as to damage our interests. At Havre, considerable experiments were made, but have been discontinued, showing that our own improved display of gas lighting is considered cheaper, more agreeable, and equally effective. We have paid off £12,000 of debentures during the year, and on the 1st of July of the present year £5700 more, and you will see that for the few renewed at the request of original holders, we now pay interest at the rate of 4 per cent. only. We propose to pay you 10½ per cent. dividend, the same as last year. We think it better to make sure of maintaining that rate than to take a further step in advance, until we see our way a little clearer. I will now move—"That the report and accounts now read be received and adopted," and when that has been seconded, I shall be happy to answer any question, or hear the remark of any Shareholder who may wish to address the meeting.

Mr. Solomon seconded the motion.

In reply to Mr. G. P. Martin,

The Chairman said perhaps that gentleman was not aware that before the profits were shown at Caen or the other stations, there was deducted from the produce of the stations 5 per cent. interest on the capital expended. Therefore, there was 5 per cent. charged for the capital laid out at Caen, and the balance was extra profit. With regard to the shares that were not taken up by the Shareholders, there were only ten shares, with £7 10s. paid on each, which had been forfeited, the calls not having been paid upon them. If it were necessary at any time to issue them, which they did not see the necessity for at present, they would do so.

Mr. H. M'L. Backler explained that the reason why the Caen station yielded less than the others was because the proportion of the public lights there was greater than at the other stations. The public lights at all the stations were supplied at less than the private lights, and where the proportion of the public was greater the aggregate returns would be less. With regard to the other matter, he would mention that their concessions were terminable, and it was specially stipulated in the regulations that there should be liberty to provide for the redemption, so that the

capital invested might be represented at the end of a concession, one mode of effecting which was by the purchase of shares. These shares had not been purchased by the Company, but were unallotted, and there was no reason for selling them at present, because the funds were not actually required. They might be considered to represent a portion of the redemption of the capital which was effected year by year. That was the way in which the redemption-fund was to be eventually employed—in the purchase and the holding of shares, or otherwise paying off the capital.

The motion was then put and carried.

The CHAIRMAN then moved—"That a dividend be declared of 21s. per fully paid-up share, and in proportion on shares only partially called, according to the amount paid thereon, such dividend on all the shares of the Company to be paid on the 1st of August next, less the interim dividend paid on the 1st of February last; the whole out of interest and profit, and free of income-tax."

Mr. MARTIN seconded the motion, which was put and carried.

The retiring Directors, Messrs. H. M'L. Backler and H. J. Baddeley, were then re-elected, and each returned thanks for his re-election. Messrs. G. Harrison and E. Garey were also re-elected Auditors.

Mr. STOKES proposed a vote of thanks to the Chairman and Directors. They had conducted the business for many years to the great satisfaction of the Shareholders, who must all be gratified to find that a fresh contract had been made at Bolbec. Trade had been bad in all parts of the world, and looking at the result of the Company's operations, he thought it must be considered as highly satisfactory.

Mr. HILL seconded the motion, which was carried by acclamation.

The CHAIRMAN, in reply, said it was a great pleasure to the Directors to meet with the approval of the Shareholders at all times, and it was particularly so now, as they had been able to lay before them a statement of accounts which showed that, bad as times were, the Company were still progressing, and improving their position. It was very gratifying to him to receive their thanks. The Directors did the best they could. They spared no pains and no trouble to look after the Shareholders interests, and he hoped they would be quite as successful in the future as they had been in the past.

The proceedings then terminated.

BRITISH ASSOCIATION OF GAS MANAGERS.

(*Concluded from page* 102.)

Mr. L. MONK (Lanark) prepared the following paper, which was read by Mr. W. CARR (Halifax):—

NOTES ON THE RAPID CORROSION OF GASHOLDERS IN HOT CLIMATES.

As the durability of gasholders differs so very much in various climates —being less in hot climates than others—and various opinions having from time to time appeared in print on the subject; and as it is an important and often very annoying subject for not only directors, shareholders, and managers of gas-works, but also for gasholder manufacturers, it occurred to me, during the delivery of that excellent, instructive, and interesting lecture, at the evening sitting of our last meeting in London, by the late Mr. T. Wills, on "The Products of Combustion," that we had partially a solution of the hitherto apparent mystery, and I thought by enumerating my ideas on the subject, and reading my "notes" at this meeting, a discussion would elicit the information necessary to enable us, under various conditions, to counteract the destructive influence of "combustion" of the iron of gasholders in hot climates. It may appear to you a misnomer, but it seems to me that such is the case, more so than "corrosion" in such climates.

To put the matter more clearly before you, it is necessary that I should quote here the second, third, and fourth paragraphs of Mr. Wills's lecture, as taken from our report of proceedings for 1878, pp. 65-6*: "The subject, 'The Products of Combustion,' is a very large one. It includes all the phenomena connected with the formation, nature, and influence of all those bodies which result from the burning of combustible matter. I propose, however, to restrict it to-night to the products of those bodies which are used for illuminating purposes. As it is in the process of combustion that such products are formed, and upon which they are dependent, a knowledge of what is involved in this process is necessary, and to this point, for a few moments, as a preliminary, I propose to ask your attention. When certain bodies are brought into very close proximity to each other, a combination, or a separation, or a re-arrangement of their constituents takes place. Such an action is called a chemical action, and under whatever circumstances such a chemical action takes place, an invariable result is observed—namely, a development of heat. Such heat is conceived to be due to the rapid motion of the molecules of which the bodies consist. The intensity of this heat varies; but when the motion is sufficiently rapid to give rise to the manifestation of light, combustion is said to occur. Now, the amount of heat which can be generated in any chemical action is fixed and definite, and it may be regarded, so to speak, as a potential property of the substance or substances which are undergoing change. It belongs to the matter in which the change is proceeding. But although this heat is an invariable quantity, and its amount cannot be altered by us under any circumstances whatever, the temperature obtained is not at all uniform; that is to say, the temperature manifested in any given chemical action, or even in the same action under different circumstances, is by no means uniform. It is always an expression of the heat evolved, but it is itself variable, and is governed by circumstances. Let me endeavour to make this point clear by illustration. If I take a piece of iron, and permit it to rust in moist air, a certain definite amount of heat is evolved by the chemical action which is going on between the iron and the oxygen of the air. The amount of this heat is dependent entirely on the amount of the iron and the amount of the oxygen which takes part in the action. But if I take such a piece of iron as this [an iron bar], and expose it to moist air, probably there would be no appreciable rise of temperature. I could not, even by the most delicate thermometer, recognize the amount of heat evolved in such a chemical process. But if I took the same weight of iron, and caused it to oxidize in the air under other circumstances, I might so develop the heat evolved in a short time, and in a small space, as to manifest itself, not only by means of a delicate thermometer, but in the visible shape of light. In this tube I have a quantity of metallic iron in a very fine state of division. The tube is sealed at both ends, and the iron is, therefore, out of contact with air. I shall break the tube, empty the contents on to this paper, and I think you will see by the incandescence which occurs with this iron, and possibly the inflammation of this piece of paper, that heat is evolved in this process of oxidizing iron, and the process is identical in every respect with the one which goes on when I oxidize a piece of iron in moist air. [The experiment was performed.] You see here we have the iron made red hot, and the paper itself takes fire. That is only an illustration of what I was saying a moment ago, that the temperature may vary, although the quantity of heat would be the same. If the weight of iron which I had in the tube had been exposed to the air in the massive state, until the metal had been converted into oxide of iron, precisely the same amount of heat would have been obtained as in this case; but the light, or manifestation to us of heat, in that action is much greater in this case than in the other. A familiar example of this occurs to me. If we take a piece of wood—say a branch of a tree—and allow it to remain lying on the ground in the forest, it gradually decays. It may take weeks, or months, or possibly years, to decay and pass away into other combinations. If, however, we thrust it into a fire, it burns, giving out heat and light; but the amount of heat in each of those cases will be precisely the same for a given amount of wood. The term combustion is usually restricted to those cases in which burning takes place with flame. In other words, those cases in which the burning bodies are in the gaseous condition. All flames are gaseous flames, and, whenever we have combustion taking place with inflammation, we are dealing with gaseous substances. Now, passing on a step further, and tracing the phenomena upwards, the temperature we can set up in a particular chemical action is an important point. Chemical actions are found to become more and more active as the temperature rises. Two bodies which act upon each other slowly at ordinary temperatures, if heated up to a higher temperature before being brought into contact, will act upon each other much more energetically. Conversely, if we reduce the temperature of the substances which act upon each other, the activity of the chemical action is reduced in the same way, and it is probable that if we could obtain an infinitely low temperature, no chemical action whatever would take place—that is to say, all chemical action might be prevented by lowering down to a sufficiently low extent the temperature of those bodies which would act on each other."

After listening to the lecture so far, and witnessing the experiment, my opinion was confirmed that the question of the greater or less durability of gasholders in various climates was entirely a chemical question, as is evident by the last paragraph, and caused more or less, as the case may be, by the amount of sulphur and ammonia allowed to get into the gasholders, especially in hot climates; and not, as frequently and erroneously insinuated at meetings of gas companies, that the iron was bad, or damaged by sea water, or other cause, in transit, or carelessness in erection, seriously reflecting on the reputation of firms of the greatest eminence in the world. If I recollect rightly, the Mauritius, Bombay, and Calcutta Companies have had serious losses from this cause, and when the Managers find corrosion taking place so rapidly, they resort to the ordinary screw patches and T-headed bolts so commonly used in the United Kingdom, and with which gasholders are employed frequently fifteen years after escapes commence; but instead of a few dozen, these are required by the gross, yet prove of no avail, and the report sent home one year, that, with ordinary repair, the gasholder, though getting leaky, would not require renewal for some years, is followed by another a few months later that a new gasholder is absolutely necessary; thus seriously upsetting the calculations of directors, and causing them to look upon their manager's reports as unreliable.

I may mention, in confirmation of what is here stated, that when in Rome, erecting gasholders, in 1872-3, part of the work in hand was resheeting the crown and two top rows of the sides of an 80-feet gasholder, and the crown of another of similar size. Rome was lighted in 1854, and those were the original gasholders. This was the fourth time new crowns had been put on, and the second time of renewing the two top rows of side sheets. Again, in 1875-6, new crowns and top rows of side sheets were required and put on, also a new crown for a 65-feet holder erected in 1872. The whole of the ironwork erected in 1872-3 was of the size and thickness generally used in the erection of gasholders of similar capacity in England, of the best Staffordshire iron, 14 to 10 gauge sheets, according to position, and usually lasting 30 to 40 years in the United Kingdom, and certainly the paint was as fresh as the day when the sheets left the works where the gasholders were made, and no corrosion had taken place from salt water or any other cause in transit.

The question we have to ask then is—What is the cause of this rapid corrosion? It is supposed by many that the imperfect purification of the gas from sulphur and ammonia is the principal cause, the enormous demand for gas suddenly necessitating the overwork of the apparatus on the entry of the Italian Government into Rome a short time previous to 1872, exceeding all the efforts of the engineers, although they had large new works with 100-feet gasholders immediately erected. There the gasholders do not as yet, so far as I am aware, show any sign of corrosion, the apparatus between the retorts and the gasholders being sufficiently large and most elaborate, whereas at the old works it is just the reverse.

I now come to the question of the "combustion" of the iron of gasholders, as the seeming proof of this. Those most exposed to the heat of the sun, and especially the portions of the crowns and sides whereon the sun plays with the greatest effect for the longest time, require renewing first, or rather repairing, and so fast when it commences, that the ordinary T-headed bolts and washers are required by the gross, and soon the crown is not safe to walk on, except with boards under the feet, the fibre of the iron being entirely gone, and merely iron in a powdered or oxide state left. Even inside, too, a portion of the framing required renewing after 18 years work. Further, is it the combination of impurities in the gas undergoing chemical change by reason of the intense heat on the crowns, producing combustion; or is it the water in the tank?

We have now to consider, What is the remedy? Would steel plates, charcoal iron sheets, galvanized iron, Bower's or Barff's process of preserving iron from corrosion, or some chemical solution in the water in the tanks prevent oxidation; or is it necessary to cover in the gasholders with houses. And what is the experience of managers in hot climates where the purity of the gas entering the gasholder is beyond question?

I may further mention, in connection with this subject, that when at Amsterdam in 1870, at the works of Messrs. De Bruyn and Sons, a galvanized iron crown was being put on a telescopic gasholder 110 feet diameter, of 10, 11, and 12 gauge plates, according to position, the only one I have ever heard of. On inquiring as to result of the experiment, Mr. Howard, the maker, replied that in his long experience of 40 years as a gasholder manufacturer, it was the only galvanized iron one that he had heard of; it was the opinion of the Engineer that it was very desirable and a matter of economy to have it galvanized; and he had received no complaint or commendation as to the results up to that time. Probably the Engineer considered it necessary, on account of the rapid corrosion of gasholders by the use of brackish water in the tanks, so common there.

In conclusion, gentlemen, I have to thank you for your forbearance in listening to my rather long notes—paper I may call it, had I written it before sending the title to the Secretary. If any discussion or correspondence on the subject should elicit such information as shall tend to decrease the cost of the wear and tear of such an expensive portion of the plant of gas-works as gasholders, and save much labour of many gas managers, my object will have been gained; and I trust the chemical and scientific knowledge of the present day will suggest remedies and instruct many of us in such education, and thus enhance the usefulness of this Association.

Discussion.

Mr. P. H. WILKINSON (Harrogate) said about eleven years since, after a good deal of corrosion of the purifier-covers, he put in a galvanized iron top, and since then he had had no trouble with it; and, so far as he had

* See JOURNAL, Vol. XXXII., *p.* 126.

seen, there was no apparent corrosion. They were now putting up new purifiers made of galvanized iron.

Mr. T. NEWBIGGING (Manchester) said that although this paper might not appear of much immediate value, it should be remembered that gas-works were now widely spread over the entire world, Englishmen being mostly called upon to manage them; and it might be the fortune, or misfortune of some of those present to have to go abroad into a hot climate, and superintend gas-works, when they would be able to appreciate the hints and suggestions contained in a paper of this character. He had a very unfortunate experience with a gasholder when abroad, and to this hour he had never been able satisfactorily to account for its rapid deterioration. He did not think that Mr. Monk covered the whole ground of the subject in his paper, for this reason, that in the instance he (Mr. Newbigging) referred to, it was not the crown nor the sides exposed to the heat of the sun which deteriorated, but the sheets near the bottom, which were usually immersed in the water. He put up a new gasholder in Brazil in 1872, and when he left that country in 1875, the holder, which was of first-class construction, was rapidly going to decay. The only way in which he could account for it was that the tank was of cast iron, and as they had to use brackish water in the tank, having no fresh water, it is probable galvanic action was set up between the cast iron in the tank and the wrought iron in the gasholder through the medium of the brackish water. It was not, he believed, oxidation at all (in the ordinary sense of the term) which caused the destructive action, because it commenced and was continued entirely from the inside, working its way outwards. On the outside the holder was perfectly sound. It was first painted, and had afterwards several good coats of tar, and eventually it might almost be said that the tar constituted the lower portion of the holder, because it was actually found that the finger could be pushed through the lower portion of the side of the vessel, and the sheets torn like brown paper.

The PRESIDENT said he presumed the purifying plant was of sufficient capacity.

Mr. NEWBIGGING said the purification, as regarded sulphuretted hydrogen, was perfect. He erected a washer also, because washers in a hot country were indispensable, and he cleared out the ammonia pretty completely—as well as it could be done in a hot climate.

Mr. J. HAMMOND (Lewes) said the best purified gas always contained a certain amount of sulphur, and he thought it would be found that the moisture raised by the sun in a hot climate, diffusing itself throughout the gas, reproduced itself in the presence of the sulphur, and decomposed the water, splitting it up into hydrogen and oxygen. In that direction, he thought, they might look for an explanation of the rapid destruction of iron.

Mr. NEWBIGGING said in the case he referred to it was not the sheets exposed to the heat of the sun that were destroyed, but those at the bottom, which were usually immersed in water.

Mr. W. BARRATT (Grantham) said he had three gasholders, one nearly 30 years of age, and he had noticed it frequently. Some of the sheets were pretty nearly done for—eaten completely through from the outside, whilst others did not appear to be at all affected by the action of the atmosphere, or gas, or water, or anything else. He was distinctly of opinion that it was the quality of the iron of which the sheets were composed that caused this rapid corrosion. He did not know what it might be in hot climates, but for the first few years after the holder referred to was erected, he was informed that it was well coated with the very best white lead and boiled oil, and he found that wherever that white lead and boiled oil continued to adhere to the sheets they were as good apparently as when they were put in.

Mr. J. WHYTE (Seaham) thought the last speaker was in the right, and that more depended on the quality of the iron than anything else. In one place where he was managing some gas-works, one of the holders was 12 years old, and in the crown there were not less than 500 leaks; another was 40 years old, and did not show a particle of leakage, which was a clear proof that more depended on the quality of the iron than anything else.

Mr. W. FOSTER (London) said it was generally admitted by chemists that two agencies were required for the corrosion of iron. Atmospheric oxygen, perfectly dry, was incapable of acting on iron, and, on the other hand, the late Dr. Grace Calvert made a number of experiments showing that iron perfectly bright, when immersed in water, boiled so as to expel the whole of the air, was incapable of oxidizing. It was the joint action of the two—air and water—which caused oxidation; so that he should think it was more to the surface of the iron being well coated by an impervious agent that they should look to prevent this corrosion. Once corrosion commenced, it soon ate its way through. There was no doubt that the oxygen in gas would contribute to this result, although it might be in small quantities, and the water in the gasholder-tank would contain oxygen, in consequence of the solubility of oxygen in water.

Mr. W. CLELAND (Linacre, Liverpool) said there was no doubt that in the interior, as well as outside of the gasholder there was free oxygen which, in the presence of moisture, and under the influence of heat, would tend to oxidize the iron; something probably was due to the quality of the iron. The presence of carbon in cast iron apparently resisted the action of oxygen upon it. It seemed to him that as the primary cause of corrosion was oxidation, the most likely way to prevent it would be to combine beforehand a certain proportion of oxygen with the plate, as was done in Professor Barff's process, covering the surface with a magnetic oxide, which formed an impervious and permanent anti-corrosive coating. He had not much faith in galvanized iron, because, although he had observed that, in some cases, after being many years in use, the sheets were as sharp at the edges as when they were galvanized, yet in other cases they perished in a few years. He had little confidence in coating holders internally with any kind of oil-paint, because, in truth, the gas generally destroyed it very soon.

Mr. G. B. IRONS (Gosport) said his experience of gasholders was principally in the South of England. The crown of one of their new gasholders was very much corroded, and the outside wall covered with paint, but they found a large number of leaks on it. On opening the crown to put in new sheets, he noticed that there were lots of small pin-holes, through which the leaks took place. There were also a series of small streaks on the sheets, which led him to agree with the gentleman who had spoken of the effect of evaporation. He had little doubt that it was the evaporation and recondensation of the water upon the interior of the crown of the holder, and its trickling down, which gradually ate into the surface of the iron, and, perhaps, there might be some little inequality in the purity of the sheet itself, where it ate through very rapidly as all the leaks were in these streaks.

Mr. CARR said no doubt this part of the discussion would be valuable to some of their members who could not attend the meeting, and he was glad Mr. Monk had brought forward a subject which would be of interest to those whose business took them abroad. Mr. Newbigging's observations added to their knowledge, but did not dispose of the argument of the paper at all, being merely a new kind of experience. In his opinion, the difficulty in the case referred to by that gentleman must have arisen from something which the water contained. He said the water was brackish, and possibly it contained something which acted energetically on the iron plates immersed in it. He did not think it could be galvanic action between the cast and wrought iron, unless there was something in the water to promote that action. What Mr. Monk contended for was—and that had been clearly proved to be the case by Mr. Hammond and Mr. Foster—that there was evidence of a slow combustion of the iron, and it was well known that combustion always took place more rapidly at a high temperature than at a low one. Mr. Monk's contention was that the excessive heat to which the crowns of the gasholders were exposed promoted a greater degree of corrosion, or greater rapidity of combustion than occurred here, and that it was not the quality of the iron that was at fault; otherwise it would be a very curious set of circumstances which occurred in Rome, for instance, where they must have had bad iron five or six times successively. Besides, he did not know that bad iron was more liable to corrosion than good iron, and was rather of opinion that all classes of iron would rust pretty nearly alike if exposed to the same conditions, unless subjected to some particular kind of protection. He was glad Mr. Cleland had referred to the coating of iron with magnetic oxide, and if there were any preparation to which iron could be subjected with a view to preserving it in a hot climate, it would be a great boon to all those who were engaged in those distant parts of the world. The causes which Mr. Monk referred to were those in which the crown went first, while the sides remained tolerably sound, and in some cases the crown had to be renewed several times, which was a great misfortune to the gas company, because of course that would not be done until the company had lost a great deal by leakage.

The PRESIDENT said there could not be a doubt that it was a most important matter, and as yet, neither by experience nor theory, did anything appear to have been started which would fully explain it. Mr. Monk's experience showed him that the tops of the gasholders were affected most by this action, whatever it might be, whilst Mr. Newbigging's was quite the opposite. With regard to the quality of the iron, one could not think for a moment that there could be such a great difference in the quality of iron used here and abroad, although it might possibly be that the surface was in the transit destroyed or injured.

Mr. J. DOUGLAS (late of Portsea) prepared the following paper, but owing to want of time it could not be read. Mr. F. W. HARTLEY, however, gave a short description of the various forms which were exhibited of apparatus for producing the light.

THE ALBO-CARBON LIGHT.

Although for the moment the electric "scare" has subsided, the lessons to be learnt from it by gasmen should not be lost sight of. We manufacturers of gas have learnt, in the first place, that there is on the part of the public an appreciation of, and a demand for a more brilliant and intense mode of illumination than that derived from the commodity in which we are interested. In the second place, we have learnt that chemically the utilization, for the purpose of producing light, of the heat derived from the combustion of air gases is the weak point in the principle on which our industry is founded; and so long as this can be asserted of gas-making, it is idle to close our eyes to the fact that there is always a possibility of electric lighting becoming the mode by which the conversion of heat into light may be most economically effected. No doubt the substitution of any other agent for gas must be a very gradual process, not only because vested interests, with all the modes of living and the habits of thought and customs bound up with them, die hard, but because the amount of machinery and expended capital engaged in the industry is so large; but if a real saving be once effected in this direction, which for the moment appears to be far from the position of affairs, the laws of political economy will make the extinction of gas lighting inevitable.

Having come to this conclusion, it is natural on the part of a gas manufacturer to inquire if no means can be found by which the conversion of heat into light can be more economically effected. To put the problem in other words: Given the heat produced by the combination of given volumes of hydrogen, carbonic oxide, marsh gas and oxygen (as in common coal gas) do any means exist of converting this heat into light more effectively than at present? I think it was Mr. Sugg who ascertained that the light obtained from an effective combustion of a given quantity of gas in proper burners was as great as that obtained by the use of the same gas by means of a good gas-engine to produce the electric light. But this only proves that the known means of utilizing gas by direct combustion are superior in efficiency to those for converting gas into force, and thence into electricity.

It is generally accepted, notwithstanding Dr. Frankland's experiments, that the heat produced by the combustion of the complex gases in coal gas yield light by the raising to incandescence of the particles of carbon mechanically held by the gas, and the answer to the above problem has been repeatedly and successfully made by methods of adding additional carbon particles to those ordinarily existing in the gas. Carburation of ordinary gas is undoubtedly a very old process, and there are few in this room but are familiar with some form or other of its application. It would serve no useful purpose at the present moment to traverse the numberless proposals for carburetting coal gas, but we cannot but be struck by the fact that of all these numberless processes there is not one sufficiently successful in its application to retain a semblance of vitality.

If the true answer to the gas manufacturer's problem, as stated above, be, "By carburation," it is worth while to inquire for a moment why all the methods proposed have practically failed. They have nearly all been based on one common principle—viz., that of exposing large surfaces of material, covered or saturated with liquid naphtha, to the action of the gas passing through the carburator. Generally speaking, the apparatus was placed near the meter from which the gas passed into the carburetting vessel, where it became saturated with the naphtha, and was carried through the pipes on to the burners. It is evident that the success of this form of carburation depended entirely on the natural volatility of the liquid used, and thus the essential quality of the whole arrangement became the chief element of danger, because unless it were kept undisturbed in close vessels, the vapour escaping at ordinary temperatures formed with the air an explosive mixture so dangerous, indeed, that it has become necessary not only to prohibit the liquid being stored in large quantities, unless under special conditions, but to limit its sale to the hours of daylight. This very volatility also introduced an element of uncertainty into the carburation; for not only did the degree of carburation vary according to the seasons of the year, but as the gas which passed first absorbed the most volatile portions, at the end of a given time the vessel contained only the non-volatile oil, which it was necessary to run off to make room for a fresh supply. In addition, the pipes throughout the building, unless carefully arranged, accumulated condensed vapour, which stopped up the flow, and completely destroyed the whole lighting arrangements.

The volatile oils having such serious drawbacks, together with the economy being questionable, carburetting by means of the dead oils has been tried with only partial success. Bowditch has the merit of being the first, if not the most intelligent worker in this direction; but, being more of a chemist than an engineer, he failed, principally in the construction of his carburetting vessels.

It is surprising that it has been left to the present time to utilize naph-

thaline alone as a carburetting agent, and there is a touch of sarcasm in the claim that it is to this once despised nuisance of the gas manufacture we may have to look for the rescue of the industry from the numerous rivals arising round it. But so it is, and, simple as the discovery seems, it is but another illustration of what "great results from little causes spring."

Most justly *The Times* newspaper in 1869 remarked: "When a great invention is achieved and published for the benefit of the human race, there are always crowds of men ready to exclaim: 'We said that it could be done long ago;' or 'We were on the point of announcing a similar discovery.' This may be all very true, but the credit is due to him who first has faith enough and works enough to produce the desired result." And we have only, in our own day, to note what enormous results have arisen from the apparently simple process of extracting the phosphorus from iron, to realize that the credit is due, not to the discoverer of a principle, but to him whose practical mind and ripe ingenuity enabled the principle to be successfully applied. In the case of the phosphorus in iron, chemists, metallurgists, and workers in iron and steel had been experimenting for 20 years, and thousands of pounds had been expended before the man arose who was to bring the knowledge to a focus, and then every one was astonished that so simple a solution had been missed so long.

Bowditch recognized readily enough that, as a carburetting agent, naphthaline was invaluable; but instead of using it in the solid form, he dissolved it in some of the liquid hydrocarbons, and employed it in a liquid state, thus exposing it to all the disadvantages which had been proved to arise from the use of liquid hydrocarbons, light or dead. To Mr. Kidd is due the merit of a persistent endeavour to utilize the refuse hydrocarbons of tar distillation for the purposes of gas carburation; but it was not till he was associated with the inventive and practical engineering ability of Mr. James Livesey that success was achieved in the form of what is called the Albo-Carbon Light. It is so called on account of the snowy white crystals of naphthaline used for the carburation of the gas, and also from the whiteness and beauty of the flame; and the difference between this method of carburation and all other previous methods consists first in the use of the solid hydrocarbon naphthaline, and, secondly, in the mechanical arrangement of the apparatus employed.

I. *Naphthaline* ($C_{10}H_8$)—melting point, 175° Fahr.; boiling point, 410° Fahr.—requires little or no description from me to an audience of this character, every one of whom, I have no doubt, has had only too painful an experience of its presence and power to annoy. As a carburetting agent it has the great advantage of being a pure hydrocarbon, and therefore there is no residuum from which to relieve the carburetting vessels after the charge is worked off. And it also has the further important advantage that under the continuance of a regular temperature the carburetting vapour is given off equally and steadily, and thus the light is not exposed to those serious variations which accompany the use of oils partially volatile, which, while giving at first an excellent light, gradually deteriorate till "the last state is worse than the first."

II. *The Apparatus.*—The difficulties to be overcome in the use of naphthaline as a carburator I have already indicated, and, before describing the apparatus, let me say one word as a tribute of admiration to the perseverance of Mr. Kidd, who, having accepted the principle of carburetting coal gas by means of the dead oils, has never relaxed his endeavours for many years to succeed practically; and also to the skill of Mr. James Livesey, who supplied the "missing link," and converted failure into success.

The principal difficulty in dealing with naphthaline as a carburator is that it crystallizes more readily in the pipes, and requires a tolerable amount of heat to get it into a liquid state. Being ordinarily solid, it has first to be reduced by heat, in the carburetting vessels, to a liquid state, and afterwards kept at such a regular temperature as to give off the exact amount of vapour to enrich the gas neither more nor less; for if the heat is not sufficient, little benefit is derived from the process, and if it is too great, the gas becomes over-saturated with the vapour, and a smoky flame is the result. The difficulty, therefore, was to devise apparatus which should regulate and control the heat, and the various means to accomplish this form the important features of the invention.

The heat required for a carburetting vessel holding, say, 2¾ lbs. of naphthaline to last for ten hours, and to yield a light equal to 450 candles, can be derived from an ordinary gas-flame not larger than that given by a night-light; but such a flame placed directly under the carburetting vessel will take two or three hours to melt the naphthaline and raise it to the proper degree of heat, which besides is unfortunately not a constant quantity, but is liable to some variations. The alteration of the external temperature and other atmospheric changes have great power to disturb the proper heat equilibrium. The varying pressure of the gas also alters the conditions, so that altogether the construction of an efficient naphthaline carburator is not so easy as it would seem at first sight.

The first difficulty to be overcome arose from the character of the material itself. Existing ordinarily in the form of light filmy crystals, it was a source of great trouble to fill the vessels, and when filled, being so bulky for its weight, it sank practically to nothing when in a molten state. This difficulty was met by melting the naphthaline beforehand, and running it into moulds in the form of candles, in which form they can easily be inserted into a horizontal vessel. For vertical vessels it is proposed to make the form that of pellets or shot; the advantage of such forms being that in filling the vessels there is no powder or refuse, which is important, because the smell arising from the least quantity left about the vessel when it became vaporized by the heat would be most unpleasant. Another advantage of clearly-defined forms is that the vessel cannot be over-filled. When it is filled either with candles or pellets, they sink to about two-thirds their original bulk when they become melted, thus leaving the pipes clear, with a sufficiency of space for the gas to mingle with the vapour.

Having pointed out the difficulties to be overcome, let me now shortly describe the ingenious methods of Messrs. Livesey and Kidd to bring the idea into practice. I have already stated that it requires a heat of 170° Fahr. to melt the naphthaline, and 410° Fahr. to bring it to the boiling point. But when it is raised to a temperature of about 212° Fahr. a hydrocarbon vapour is given off, sufficient to saturate the gas fully—that is, to the extent necessary for giving the best illuminating results; for if too much vapour be mixed with the gas the flame becomes smoky, with a loss of light and waste of material; while if there be too little, the full effect of the carburation is not obtained.

It is not enough, however, to devise a vessel which shall produce this vapour. It has been found that even when heated to 300° Fahr. the vapour simply floats on the surface of the melted naphthaline, and therefore it is necessary to direct the stream of gas upon it, so that some force may be applied to detach the vapour and cause it to readily mingle with the gas.

I have here the apparatus for carburating a single light. You see it is about the size of a cricket-ball. The ornamental knob at the top is made to unscrew, so as to charge the vessel with material, in the shape of small pieces of candle, or pellets. One of the minor troubles was how to make this knob joint perfectly gas-tight. Leather, cork, india-rubber, and paper washers all failed when exposed to the action of the gas combined with the naphthaline vapour. It was not so much keeping in the gas that was the necessity, but the naphthaline found its way through in most minute quantities, and created an unpleasant smell in the room. At last it was found that asbestos washers answered most effectively, and the joints are now made in that manner. At the bottom you observe another ornamental knob, the end of which is made taper, so as to fit into a small socket; this socket is a little larger than a gas-burner, and has a burner thread upon it, so that it may replace an ordinary burner where the albo-carbon light is wanted. The apparatus is simply dropped into this socket, just as a stopper is into a bottle, and a perfect gas-tight joint is made.

The gas supply-pipe in the interior of the vessel is carried sufficiently high to be above the melted naphthaline, and is bent down or a hole made on the under side of the pipe, so that the gas shall blow directly on the surface of the carburetting material. The outlet-pipe is taken from near the top of the ball, and is bent downwards four or five inches, and again bent so that a burner may be fixed in a vertical position. From one side of the vessel, and immediately above this burner projects a blade of copper, which, being heated by the flame, conducts an amount of heat to the body of the vessel sufficient to vaporize the naphthaline. The height of this copper blade from the flame, and its width, are such as experience has shown to be the best for the purposes intended. The diameter of the ball and other conditions have also been determined by experience.

This vessel here is charged with about 5 oz. of naphthaline, and will carburet the gas from this burner for 20 hours. It will therefore require filling twice a week. There is no wick to turn and trim, as in a lamp, nor any delay in pouring in liquid oils. Indeed, the process is so simple that a child can do it, and it is absolutely free from danger.

The burners recommended are No. 1 Bray's, consuming from 2 to 3 feet per hour, according to pressure, and giving with 14-candle gas little or no effective light. When the gas is first lighted, the material in the vessel is in a solid form, and it requires several minutes before the effect of the carburation is seen; but gradually the light assumes, as you see, a peculiar brilliancy, and the illuminating power is raised rapidly to about 37 candles. After the carburation is once in force, less gas passes through the burner than when first lighted, because, the orifice remaining the same, and the gas and vapour passing together through it, the quantity of gas must be slightly reduced as well as the pressure. There is nothing more remarkable than the way in which the vapour of naphthaline appears to steady the flame, producing a pleasing contrast to the flame of ordinary gas burned in a bat's-wing or fishtail burner, as against the beautiful and steady flame of the albo-carbon light.

For lighting on any larger scale, a similar vessel, but of somewhat greater dimensions, may be arranged for several lights; but where more burners are required to make up a large group, a different form of application of heat is required to vaporize the material, as may be seen by the apparatus on the table, which has 12 burners. Instead of the heat being conducted by a metal plate, it is derived from a small supplementary burner, which is turned full on when the gas is lighted, in order to get up the carburation more rapidly, and afterwards turned down to a small jet. This, of course, would require personal attention; but the patentees have succeeded in making a very simple automatic regulator, which is acted upon by the heat of the material inside the vessel. This important addition is of great value in maintaining a regulated heat. They have also completed an arrangement applicable for one or more groups of lights having a supply reservoir sufficiently large to contain a week's supply of material, and yet so arranged that the lights are fully carburated in a few minutes. These two instruments are of so recent a date, that I am not at liberty to do more than casually refer to them. The carburated lights may be applied to a long line of pipes—the whole length of this room, for instance—by fixing the burners at about 8 inches apart, with the flame arranged a little lower than usual, so as to heat the pipes and thus prevent condensation. Steam may also be employed as a means for vaporizing the material, and to keep the pipes warm for almost any distance; but the details of these and other applications are much greater than I am able to deal with in this paper. No doubt they will be fully described at some other time.

As a practical illustration of the successful application of the albo-carbon light on a large scale, I may instance that of the eastern section of the Westminster Aquarium, which has now been lighted up for the last five months by this process. Before the introduction of the new light, this part of the building was illuminated by 500 (Bray's No. 4) burners, but is now lighted by 200 burners only (Bray's No. 1), and I am informed that the volume of light is more than double what it was previously. The amount of naphthaline consumed, taking the average of summer and winter, is about 12 lbs. per day, and so successful in point of economy and improved illumination has been the experiment, that I understand the Directors have decided to introduce it throughout the whole building.

Results.—I have now traversed exhaustively—perhaps too exhaustively—the details of this new, and, as I think, successful method of carburating ordinary gas, and we are now prepared to see how far it supplies the solution of the problem stated in the opening of this paper—a problem of infinite consequence to our manufacture. By means of this cheap and effective hydrocarbon, not only can ordinary gas be manipulated so as to yield a white light equivalent to 500 or more candles, but, what is of even more consequence, without any increase in the cost, so as to put it beyond the reach of ordinary commerce, but, as will be seen from the following figures, a considerable economy will be effected:—The value of melted naphthaline in the form recommended is about 4d. per pound, and it may be reckoned that to carburet 1000 cubic feet of gas will require 4¼ lbs. of naphthaline, or an addition of 1s. 6d. per 1000 cubic feet to the cost of the gas. If we reckon the illuminating value of 1000 feet of gas at 14,000 candles, taking the ordinary average of 14-candle gas, then the addition of 4½ lbs. of naphthaline, costing 1s. 6d., will increase that value to 40,000 candles; that is to say, the same volume of carburetted light is given for 5s. that would cost 10s. 6d. for ordinary gas, and in such a convenient and practicable form that it may be obtained in any workshop, warehouse, or magazine in the proportions in which it is desired. A light of 40 candles or of 500 candles may be obtained as readily as one of 10 candles. No doubt its use very extensively in a single town may *pro ratâ* diminish the quantity of gas consumed alone; but that is no unmixed evil if the system shows an inclination on the part of the public to rely for the most economical illuminating results on an agency which involves the continuance of gas manufacture.

I have left till the last part of my paper a suggestion that may be of no great value in the British Islands, but in the Colonies, where coal is scarce, and where gas has become a necessity, may be of immense importance.

Bunsen, in his "Researches on the Combustion of Gases," has shown that the combination of air and hydrogen yields a temperature of 2044° Fahr., and air and carbonic oxide 2492°; so that if the old process of water-gas were revived, and the carburation were carried on as here detailed, a rich and effective illuminating gas could be obtained, and at a very small cost. I am not quite certain, but, if my memory serves me, the New Gas Company, from whom so much was at one time anticipated, produced their heating gas at a cost not exceeding 8d. per 1000 cubic feet, and if the

carburation on the above basis cost 1s. 6d. per 1000 cubic feet with an illuminating value of 26,000 candles, it would revolutionize the gas manufacture in many a distant town, and introduce it, with all its civilizing advantages, into many others where it is now unknown.

Discussion.

Mr. G. B. IRONS (Gosport) said that last year Mr. Douglas was President of the Portsmouth Literary and Philosophical Society, and his introductory address was on the subject of artificial lighting. Amongst other things shown on that occasion was the albo-carbon light. He had seen it exhibited in the Westminster Aquarium, and considered it gave a very good light. The only objection to it was that there was a slight effluvium from the naphthaline.

Mr. W. CARR (Halifax) said that he had had one or two of the lights to exhibit at the gas apparatus exhibition at Halifax. They were shown rather as a curiosity than otherwise, because he did not think it would answer his purpose much to introduce the albo-carbon light, seeing that it was its special province to lessen the quantity of gas required. He thought gas was sufficiently good for all ordinary purposes, and if people did not get light enough, he would rather encourage them to use a little more gas. He was particularly struck with the smokiness of the flame, and this meant that a quantity of the vapour of naphthaline was passing away unconsumed, which led inevitably to the smell of naphthaline in the room, otherwise it was a beautiful improvement. The effect produced with the small burners used was simply marvellous, but it ought to be stated that those burners were not at all well adapted for light-giving purposes. Ordinarily speaking, they were about the worst class the consumer could use for common coal gas, and therefore the contrast shown when the naphthaline vapour got into the flame was very great; but if one of these burners with the naphthaline burning in it was compared with a good flat-flame burner burning 5 feet of gas per hour, the light would be pretty nearly equal. His own impression was that it would be better for the consumers to use a 5-feet flame than have small burners and be troubled to fill the albo-carbon apparatus, and attend to it whenever it required attention. He should like to know whether it would be cheaper to obtain a given amount of illumination by the use of the albo-carbon light, or by using an additional quantity of gas (take, for example, London gas), and, if so, how much cheaper? That was a point upon which the success or otherwise of the apparatus must depend. Therefore it was important that they should be supplied with some particulars giving the relative cost, light for light, of that supplied by the albo-carbon gas and by ordinary coal gas, otherwise they might be admiring a beautiful effect without knowing the cost of it. If the cost for a given amount of light was much less than for that produced by coal gas, the Albo-carbon Light Company had a large field before them, but the cost must be considerably less than gas, in order to make it worth while to undergo the trouble of fixing up the apparatus and attending to it. Besides, its success was likely to be its own ruin, for if it were cheaper to commence with, the extra demand for naphthaline—which was a product of coal tar—and the lessened quantity of tar produced, which would result from the increased use of this naphthaline, would naturally tend to raise the price, and thus place it at a greater disadvantage compared with gas consumed in the ordinary way.

Mr. S. ARMOUR, who had been exhibiting the light, said it had been found at the Westminster Aquarium that 200 burners, fitted with the apparatus, did the work of 500 supplied with ordinary coal gas, and produced a very beautiful light, while the registration on the meter was exactly one-half. Generally speaking, after the cost of the naphthaline used was allowed for, the charge came out about one-half that of the gas previously paid for. For example, if a man paid £100 a year for gas, he would, if using the albo-carbon apparatus, burn something like one-third the quantity of gas, and adding the cost of the carburetting material, the expense would come out to about one-half the previous amount. With regard to the smell, there was no smell in burning, unless the apparatus was defective. The carburetting material had the peculiar property of steadying the gas-flame. Experiments showed that they could not so advantageously carburet gas when used in an Argand burner; they must employ a flat-flame burner. In a recent report upon the results of a series of experiments made to ascertain the photometric and the commercial value of the albo-carbon light, Mr. Keates recorded the following facts:—Five cubic feet of gas burned in one of Sugg's Argand burners gave the light of 16 candles. The same quantity of similar gas burned in a Bray's No. 1 burner connected with the naphthalizing (albo-carbon) apparatus gave the mean light of 36·7 candles, showing a gain of 20·7 candles upon 16—*i.e.*, 2½ times in favour of the apparatus. The light given by a No. 4 fishtail burner, when burning ordinary 16-candle gas, was about 10 candles, calculated for a consumption of 5 cubic feet of gas per hour. This was the size burner which was probably used more frequently than any other by gas consumers, and the gain of light in the naphthalized gas became much more striking when this burner was used as the standard of comparison, instead of the Sugg burner. Taking 10 candles to be the lighting power of such a burner, the advantage in favour of the naphthalizing process was the difference between 10 and 36·7, or 26·7 candles; so that the naphthalized gas gave 3⅝ times as much light as the ordinary gas, which was an increase of 267 per cent. It was also found that the increase of light was materially assisted by the pressure. If the pressure was 1½ inches, there was as much as seven times the light of the same burner non-carburetted; but if the pressure was in excess of that, there would be as much as ten times the light when No. 1 burners were used. The greater the pressure the more naphtha-line could be conveyed into the flame, and therefore the higher the illuminating power obtained.

Mr. CARR wished to explain that his remarks did not apply to Mr. Bray's burners in general, but simply to the size of the burners used on the present occasion.

The PRESIDENT said there were still five papers on the list, but he feared they must be taken as read, otherwise there would not be time left for disposing of the general business of the meeting. He proposed, therefore, that these papers be taken as read, and printed in the Transactions of the Association.

This resolution was unanimously agreed to, and the general business was then proceeded with.

[A report of this was given in the JOURNAL for June 17, pp. 935-6.]

GLASGOW WATER COMMISSIONERS.

At a Meeting of the Glasgow Town Council, sitting as the Water Commissioners, last Thursday, it was reported that at a meeting of the Water Committee, held on the 27th of June, there was submitted the abstract statement and accounts for the year ending the 28th of May last. The rates assessed and levied during the year were the same as those levied during the previous year, and were as follows:—The domestic water-rate within the city and royal burgh of Glasgow, being the limits of compulsory supply, 8d. in the pound, and the public water-rate within the said limits, 1d. in the pound. The domestic water-rate levied beyond the limits of compulsory supply was also the same as the previous year—viz., 11d. in the pound.

From the accounts it appears that—

The revenue for the year amounted to	£140,231 6 5		
The revenue from river supply works to	347 5 1		
		£140,578	11 6
The expenditure, including annuities and interest, amounted to	£121,130 9 9		
The expenditure for river supply works amounted to	4,598 2 0		
		125,728	11 0
		£14,850	0 6
Carried to sinking-fund account		15,006	2 2
Balance carried against revenue account, year 1879-80		£246	1 8
The total revenue for last year was		£140,578	11 6
The total revenue for the previous year was		138,292	8 10
Increase		£2,286	2 8
The total expenditure for last year, exclusive of sum carried to sinking-fund, was		125,728	11 0
The total expenditure for previous year, exclusive of sum carried to sinking-fund, was		115,450	3 9
Increase		£10,278	7 3

The amount added to capital account during the year was £31,138 17s. 11d. The sinking-fund, set apart for the redemption of mortgages or annuities, now amounts to £164,735 3s. 5d. The Committee have resolved to continue, for the year commencing the 28th of May last, the same domestic water-rates, public water-rate, and charges for supplies of water for other than domestic purposes as those of the preceding year.

The quantity of water sent into the city and district during the year averaged as follows:—

	Gallons per Day.
From the Loch Katrine works	34,222,906
From the Gorbals works	3,413,359
Together	37,636,265
Average for 1877-78	34,012,757
Increase	3,623,508

In moving the adoption of the accounts, Bailie WADDELL said they had now a sinking-fund of £165,000 from which to pay mortgages. In the course of a year or two the sum would be increased, and in the event of an extension of works being required, the sinking-fund was such as to enable the Commissioners to carry out an extension without an increase of the rates.

DUNDEE GAS COMMISSION.

From the accounts of the Dundee Gas Commission, for the year ending April 30 last, it appears that 322,807,700 cubic feet of gas were manufactured during the twelve months, and accounted for as follows:—

Feet.			At per 1000 Feet.				
668,200	sold in Dundee,	by meter,	4s. 3d.	£139	4 2		
247,966,800	„ „	„	3s. 11d.	48,560	3 6		
46,800	„ „	by contract,	3s. 11d.	9	3 5		
1,362,200	„ Harecraig,	by meter,	4s. 11d.	334	17 7		
1,454,400	„ Invergowrie,	„	4s. 11d.	357	10 9		
626,800	„ Downfield,	„	3s. 1d.	169	6 4		
19,080,200	for public lamps,	by contract,	3s. 8½d.	3,537	15 3		
271,205,400	total quantity sold.			£53,698	1 0		
	Meter-rents			2,416	12 6		
						£55,514	13 6
	Off discount			£2,183	14 7		
	Bad debts			176	19 8		
						2,360	14 3
2,500,000	consumed at works, &c.						
49,102,309	unaccounted for—15·21 per cent.						
322,807,709	total quantity made.	Amount realized				£53,153	19 3

To manufacture this quantity 28,329[13] tons of coal were carbonized, the cost of which was £31,172 14s. 6d., divided as follows:—

Amount paid for coals	£25,379 9 1	or £0 17 11	per ton.
„ „ firemen's wages	4,851 8 5	„ 0 3 5	„
„ „ breaking, haulage, &c.	941 17 0	„ 0 0 8	„
	£31,172 14 6	or £1 2 0	per ton.

The total amount authorized to be borrowed for the purposes of the gas undertaking is £200,000—viz., £40,000 under the Dundee Gas Act, 1868; £60,000 under the Amendment Act of 1872; and £100,000 under the Additional Powers Act of 1877. The amount borrowed, at 4 per cent., is £120,597 10s., leaving £79,402 10s. still to be raised. Up to April 30, 1878, £112,500 18s. 8d. had been expended on capital account, and in the next twelvemonth £5768 9s. 4d. was added; making a total expenditure to April 30 last of £118,269 8s. During the year £4150 of mortgages were redeemed, and £450 of borrowed money paid off. The following is the

REVENUE ACCOUNT, FOR THE YEAR ENDING APRIL 30, 1879.

Expenditure.

To Coal account, including wages of firemen, &c.	£31,172	14 6
Purifying account, wages and materials	683	0 8
Main-pipe repairs, do.	257	2 5
Service-pipe repairs, do.	594	12 8
Repairs of buildings, do.	531	8 5
Gas apparatus, tools, &c. do.	651	5 10
Retorts and setting—retorts and building	1,154	7 3
Meter repairs, including wages of inspectors and fitters	707	5 10
Refuse account—cartage of refuse	329	18 2
Assessments, taxes, &c.	1,664	17 6
Rents, feu duties, &c., less rents received	368	7 8
Salaries, including collection of revenue	2,529	13 0
Stationery, advertising, &c.	203	0 2
General expenses	258	1 5
Gas-engine, cost of experiments with electric light, including exhibition of stoves, burners, &c.	59	1 3
	£41,194	16 9
Balance to net revenue account	16,791	1 9
	£57,985	18 6

Revenue.

By Gaslight account	£50,737	6 9
Meter-rents	2,416	12 6
Chemical products	3,943	8 7
Coke	888	10 8
	£57,985	18 6

GALASHIELS GAS COMPANY.

The Forty-Fifth Annual Meeting of this Company was held on Tuesday the 1st inst.—Mr. F. Rutherford in the chair.

Some particulars contained in the Directors report were given in our "Trade Notes from Scotland" in the Journal of that date. The leading item in it was the recommendation of the Directors to reduce the price of gas from 3s. 9d. to 3s. 6d. per 1000 cubic feet.

Mr. Stewart moved an amendment to the effect that the sum of £1039 be set aside to meet any extraordinary contingency, and that this sum be always available for that purpose. He considered his motion to be in strict conformity with the 17th article of the deed of co-partnery.

The Secretary (Mr. Haldane), on being appealed to, did not put the same interpretation on article 17 as Mr. Stewart. He said the liability of the Shareholders was limited.

After considerable discussion, Mr. Stewart agreed to withdraw his motion on the understanding that it would be moved again next year.

Mr. Brown then proceeded with the motion of which notice had been given:—"That in future no dividend be declared exceeding 15s. per share, or 7½ per cent. per annum on the present share capital." He said he proposed that motion for the purpose of putting an end to the contention which had existed for several years between the two classes of Shareholders—namely, the large Shareholders whose interest it was to have a large dividend, and the class of Shareholders who were large consumers, and whose interest it was to have both cheap and good gas. After the new works were started, the management was for some years in the hands of the large consumers, who kept down the share capital to £9000. They borrowed the rest of the money, paying it off year by year, and for that purpose the price of gas was kept higher than it would otherwise have been. When the large Shareholders obtained the management, they raised the denomination of the capital, and instead of paying £900 annually upon capital they were now paying £1800. That was one result of the change of management from the hands of the large consumers to those of the large Shareholders. He considered that they were right, as representing the interests of the consumers, to ask a fair and reasonable thing—namely, that the dividend should not exceed 10 per cent. on the actual capital. That had already been done at such places as Hawick, Selkirk, and Coatbridge.

Mr. P. Sanderson seconded the motion. In doing so he said that under the management of the large consumers, with the share capital at £9000, they paid off a bond of £5000, and at the same time they took 5 per cent. for depreciation. In 1870, £900 was set apart for depreciation, and £900 laid aside for the surplus fund. When the large Shareholders obtained the management, they reduced the rate of depreciation to 3 per cent., and then to 1½ per cent., while the dividend was raised to 12½ per cent. In a short time they took £5736 out of profit, and divided it amongst themselves, and by a stroke of the pen raised the denomination of the shares from £7 10s. to £10. He thought the motion a fair compromise.

Provost Hall moved the previous question as an amendment, which was seconded by the Chairman.

After some discussion, the vote was taken, when the amendment was carried by 88 to 56 votes, a great many Shareholders voting by proxy.

OLDHAM CORPORATION GAS SUPPLY.

We have been favoured with a copy of the accounts of the Oldham Corporation Gas-Works for the period commencing Aug. 31, 1878, and ending on March 25, 1879, prefaced by a statement addressed to the Chairman and Members of the Gas-Works Committee by the Superintendent of the Works (Mr. Herbert Andrew).

From this it appears that the expenditure on capital account during the above period has been as follows:—

Higginshaw gas station	£1342 16 5
Gas-mains	42 14 9
	£1385 11 2

The amount of gross profits earned during the nine months ending March 25 last was £30,498 15s. 9d., and after paying therefrom the annuities, the interest on mortgages, and adding £1442 10s. to the sinking-fund, there remained the net profit of £23,109 9s. 1d. for disposal.

The price of gas for the quarter ending Sept. 25, 1878, was 4s. 6d. per 1000 feet, with the following discounts, if paid within the stipulated period:—Within the municipal borough, 1s. under, and 1s. 2d. above 5 million cubic feet quarterly consumption; beyond the municipal borough, but within the limits of supply, 8d. and 10d. respectively; beyond the limits of supply, net.

During the quarters ending Dec. 24, 1878, and March 25, 1879, 4d. per 1000 feet less was charged, with discounts as above.

The quantity of gas manufactured at the different stations during the nine months ending March 25, 1879, was as follows:—

Oldham gas station	126,348,000 cubic feet.
Higginshaw „	122,511,000 „
Hollinwood „	129,218,000 „
Royton „	24,769,000 „
Total	402,846,000 cubic feet.

against 406,910,000 cubic feet in the corresponding period of the previous year; and the quantity of cannel and coal carbonized in its manufacture was 40,001 tons 8¾ cwt., being a decrease of 332 tons 17½ cwt.

The average quantity of gas made per ton of cannel and coal carbonized was 10,070 cubic feet.

The quantity of gas delivered was 402,751,000 cubic feet, against 406,650,000 cubic feet in the corresponding period of the previous year, or a decrease of 0·958 per cent.

The loss of gas from leakage and condensation was 27,989,400 cubic feet, or 6·949 per cent. of the quantity delivered.

The maximum quantity of gas delivered in 24 hours was 2,821,000 cubic feet on the 13th of January, and the greatest production was 2,813,000 cubic feet.

The average illuminating power of the gas during the nine months was equal to 18·3 standard sperm candles, consuming at the rate of 120 grains per hour, in comparison with an Argand burner consuming 5 cubic feet of gas per hour. The illuminating power of the gas prescribed by the Oldham Borough Improvement Act, 1865, is 14 candles. The gas supplied was therefore equal to 4·3 candles above the standard.

During the nine months 1515 new meters were fixed, and 1354 consumers added. The total number of meters now in use is 30,285, and the number of consumers is 29,576.

The length of gas-mains laid in extensions, enlargements, and renewals, was 7743 yards, and mains taken up 4998 yards.

The number of public lamps within the district of supply is now 2702, being an increase, during the nine months, of 69. There are now 1952 public lamps within the corporate borough, and 750 public lamps in the out-townships.

Revenue Account for the Period from Aug. 31, 1878, to March 25, 1879.

Receipts.

Sale of gas—			
Gas per meter to private consumers	£71,502 0 8		
Gas for public lighting	4,320 3 7		
	£75,822 4 3		
Less discounts	15,116 14 5		
		£60,705	9 10
Residual products—			
Coke, less labour, £68 9s. 11d.	£3,661 7 0		
Lime	59 14 4		
Tar	6,342 14 9		
Ammoniacal liquor	4,181 19 6		
		14,245	15 7
Rents of cottages, mains, &c.		294	0 11
Fine		2	2 0
Services, meters, &c.		1,982	3 8
		£77,229	12 0

Expenditure.

Manufacture of gas—			
Cannel and coal, including carriage, unloading, and all expenses of depositing same on works	£29,605 8 5		
Purifying materials and wages	1,472 2 1		
Oil, water, and sundries	353 13 10		
Rent of telegraph	57 0 0		
Salaries of Manager, Assistant Managers, and Officers at works	615 18 0		
Wages (carbonizing)	5,086 6 1		
Repairs and maintenance of works and plant (including renewal of retorts), tools, materials, and labour	3,166 4 0		
		£40,356	12 5
Distribution of gas—			
Salaries and wages of Officers (including Rental Clerks)	£738 3 8		
Repair, maintenance, and renewal of mains and of service-pipes, less received for old materials, £60 1s.	1,331 13 4		
Services, meters, &c.	1,468 9 0		
		3,538	6 0
Rents, rates, and taxes—			
Rents	£499 18 7		
Rates and taxes	1,469 14 5		
		1,969	13 0
Management—			
Salaries of Superintendent and Clerks	£222 19 0		
Salaries of Collectors	171 2 0		
Proportion of Town Clerk's and Treasurer's salaries	146 0 0		
Stationery, printing, advertising, and stamps	132 10 9		
General establishment charges and incidentals	131 9 4		
		804	1 1
Law expenses, deed stamps, &c.		12	4 2
Bad debts		49	19 7
Balance carried to profit and loss account		30,498	15 9
		£77,229	12 0

Statement of Coals Used.

Description of Coal.	In Store, June 25, 1878.	Received during the Nine Months.	Carbonized or Used during the Nine Months.	In Store, March 25, 1879.
	Tons.	Tons.	Tons.	Tons.
Coal	2,779	20,440	21,366	1,853
Cannel	3,554	17,911	19,758	1,707

Statement of Residual Products.

—	In Store, June 25, 1878.	Made during the Nine Months. Estimated.	Used in Manufacture during the Nine Months. Estimated.	Sold during the Nine Months.	In Store, March 25, 1879.
Coke. Tons.	50	24,000	11,985	12,015	170
Tar „	1,195	2,908	—	3,052	1,051
Ammoniacal liquor—Gals.	85,179	692,520	—	526,361	251,338

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.			Quantity Used on Works and for Gratuitous Lights.	Total Quantity Accounted for.	Quantity not Accounted for.	Number of Public Lamps.
	Public Lamps.	Private Lights.	Total Quantity Sold.				
Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
402,751	29,165	339,434	368,599	6,163	374,762	27,989	2,702

Statement of Gross Profit and the Mode of its Appropriation from 1875 to 1879.

Year Ending.	Gross Profits.	Maximum Price of Gas per 1000 Cubic Feet within the Borough.	Appropriation of Gross Profits.			Appropriation of Surplus.		Profit for Disposal.
			Interest and Annuities.	Sinking-Fund.	Surplus.	Capital Account.	Paid to Borough-Fund.	
	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Aug. 31, 1876	25,946 17 9	3 8	10,192 9 5	2,248 0 0	13,506 8 4	5,506 8 4	8,000 0 0	—
Aug. 31, 1877	33,743 10 10	3 8	9,832 11 9	2,248 0 0	21,662 19 1	13,662 19 1	8,000 0 0	—
Aug. 31, 1878	34,731 18 2	3 6	9,840 15 5	2,248 0 0	22,643 2 9	12,643 2 9	10,000 0 0	—
Period ending March 25, 1879	30,498 15 9	3 months 3 6 / 6 „ 3 2	5,944 16 8	1,444 10 0	23,109 9 1	—	—	23,109 9 1
—	124,921 2 6	—	35,810 13 3	8,188 10 0	80,921 19 3	31,812 10 2	26,000 0 0	23,109 9 1

£33,021 1s. 10d. was transferred to Capital account from profits to Aug. 31, 1875.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of this district is extremely dull, and for all classes of round coal there is a continued falling off in the demand. The better qualities for house-fire purposes are now very bad to sell, and although list rates are without material change, extremely low prices are being taken to secure orders, the better classes being now obtainable at under 7s. per ton at the pit mouth. For gas-making coals there have been very few inquiries during the past week, and so far there has not been the average demand, owing to many of the Gas Companies having been able last season to cover their requirements over two years, whilst in many cases those who are now in the market are holding back, with the view, if possible, of securing more favourable terms. The prices at which contracts are taken continue very low, and although there are some colliery proprietors who are holding out for more money—but are selling little or nothing—6s. 6d. to 7s. per ton will represent the full price which is being obtained for good gas Arley at the pit mouth, whilst the inferior Wigan mines of gas coal have sold at prices which scarcely leave 5s. per ton at the pit. Common round coal for steam and forge purposes continues very low in price, and ranges from 4s. 6d. to 5s. 3d. per ton at the pit. Burgy is in very limited request, and is quoted at from 3s. 6d. to 4s. 3d. per ton at the pit. Slack is becoming rather scarcer in some districts, but this has no appreciable effect upon prices, nor is it probable there will be any material advance this summer with the very limited requirements of brickmakers, millowners, and chemical and salt manufacturers. In the better qualities at the pit mouth 3s. 6d. per ton is still about the top price, with common sorts ranging from 2s. per ton upwards.

The pits, in the majority of cases, continue to work very irregularly, and there are very few districts where they are running more than three and a half to four days a week.

The iron trade continues in a very depressed condition, and the market is unsettled by continual rumours of further impending commercial difficulties. Lancashire makers of pig iron are doing little or nothing, and prices are scarcely more than nominal, although 44s. per ton for No. 3 foundry iron, less 2½, delivered into the Manchester district, is about the figure at which they would be prepared to do business. Finished iron is extremely low in price, and for a good specification common bars could be bought for about £5 per ton, delivered into the Manchester district.

The colliers strike in the Tyldesley district has terminated by the men going in on the masters terms, but the strike of engineers in the Ashton district continues.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The Durham gas coal trade continued in a quiet state last week. The best collieries in the trade seem anxious to make contracts to run over the remainder of the second half of 1879. They pick up all that is going. The rate, stated broadly, does not exceed 6s. per ton. Nearly all the business done for best gas is at about this figure. Second-class gas coals continue quiet in demand, and low in price. Inferior and unscreened sorts showed low quotations for shipment at the Tyne Dock last week. A good deal of business in gas coals continues to be transacted with Ireland. Freights thence by small sailing vessels are low, though, upon the whole, a little more money has had to be paid lately upon the outward coasting business. Gas coals have been sent from the Tyne to Russia this year in large quantities. The shipments of gas coals to Sweden, Denmark, and Norway have also been pretty considerable. These latter countries seem to be pretty fully supplied with coals for the present. A good demand has been kept up from Holland and the North of France. There have been fair inquiries, too, from the Mediterranean. It is clear that with the present low range of prices, the Durham gas coal-field can hold its own against all competitors. The Germans seem to have no chance, even if their coals were suitable for gas purposes.

The coasting business has been a trifle dull. There have not been many orders in the market for gas coals. But the scarcity of handy little sailing vessels has kept the rates up. 4s. 10½d. still remains the figure for gas coals to be delivered from sailing ships at the wharves in London river. About 1½d. per ton more money has, in some instances, had to be paid for suitable sailing tonnage to load gas coals for the Channel ports. 6s. 9d. was done on Saturday for a steamer to load gas coals for Dublin. This rate dominates the other Irish ports. To the eastern counties, sailing ships get about 4s. 1½d. per ton. A fleet of light vessels may be expected in the coal ports within the next eight or ten days, and the prospect of their arrival will prevent quotations exceeding the present figures.

The general manufacturing trades of the North of England were a little unsettled last week. There was a stoppage in the Cleveland iron trade, with rumours of difficulties, which, notwithstanding these rumours were accredited with covering stock-jobbing operations, had a very unsettling effect upon business. The chemical market, however, kept steady; indeed, prices advanced 1 per cent. upon the trade of the week. Business in the fire-clay goods and fire-brick trades seems to be unequally divided. One or two large concerns with extensive and old-established connections have done and are doing, remarkably well. The others have a somewhat struggling time, and the quotations of prices in consequence are therefore irregular and unreliable. The price of lead keeps low; the market is very dull. A fair trade is doing in cement. The shipments of sewage-pipes to the Continent continue to be rather large. Holland seems to be attending to sanitary arrangements more than usual, as the Dutch are the largest importers. The market for skilled and unskilled labour is slack. Skilled labour is getting fast back to a standard of 24s. to 25s. per week, and labourers to 16s. and 18s. The entire mining population of Northumberland and Durham on the average will not exceed 18s. per week.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

A dividend of 5 per cent. has been declared by the Aberfeldy Gaslight Company, and the price of gas has been fixed at 8s. 4d. per 1000 cubic feet, being the same as that charged last year.

At the nineteenth annual general meeting of the Renton Gaslight Company, which was held on the 4th inst., a dividend of 10 per cent. was declared on the past year's transactions, in accordance with a recommendation of the Directors, and the price of gas was lowered from 5s. 5d. to 5s. per 1000 feet. It was also resolved to increase the capital stock of the Company by converting the £1 into £2 shares. These resolutions show a favourable state of affairs both for the Shareholders and the gas consumers.

The annual meeting of the Irvine Gas Company was held on Tuesday week—Ex-Provost Paterson in the chair. From the statement of accounts submitted by the Secretary (Mr. James Dickie) it was shown that after meeting all the expenses there was a balance in the bank of £1082 to pay the annual dividend on the original shares. The Directors recommended a dividend of 10 per cent., to which the meeting unanimously agreed. It was resolved to allow the price of gas to remain as during the past year—namely, at 5s. per 1000 feet.

The Shareholders of the Berwick Gaslight Company held their annual meeting last Wednesday—Alderman Purves in the chair. The annual balance-sheet showed an income of £4700 11s. 8d., and an expenditure of £3850 10s. 8½d., giving a balance of £850 0s. 11½d. A dividend of 7½ per cent. was recommended by the Directors, which was agreed to. This is 2½ per cent. less than formerly, but it was stated that the reduction was owing to extra expenditure for retorts during the past year, and to the lowering of the price of gas from 5s. 10d. to 5s. 5d. per 1000 feet.

At a meeting of the Dundee Police Commissioners, held on the 10th inst., it was reported that the Lighting Committee had agreed to apply to certain of the larger towns in England and Scotland for information as to the price of gas per 1000 cubic feet for 1878-79; the average illuminating power in candles; the average distance between the public lamps in, say, three leading streets; the area in square yards lighted by each lamp; the description of lamp used, and area of glass in each lamp; the description of burner used; the consumption of gas per hour in each lamp; the cost of each lamp and lamp-post (separately); the total charge for gas, lighting, extinguishing, cleaning, and maintaining, per lamp; the price of gas coal per ton delivered; and any other explanation they might have to give. One of the Commissioners said he did not see that much good would come of such an inquiry; but Mr. Henderson, on whose motion the Lighting Committee came to the decision, thought if they paid £5000 a year for their gas they had a right to see that it was supplied on the best terms. The resolution was ultimately approved of.

The annual meeting of the Bothwell and Uddingston Gas Company, Limited, was held on the evening of Monday week—Mr. William Barr, in the absence of Dr. Goff, presiding. After the balance-sheet was considered and unanimously approved of, it was resolved to declare a dividend of 7½ per cent. on the paid-up capital of the Company (£9000), and that the price of gas should be reduced from 5s. to 4s. 7d. per 1000 feet.

There seems to be some prospect of a collision between the Kelso Police Commissioners and the Gas Company, on the question of the price charged for the gas supplied to the public lamps. Finding the price of gas to ordinary consumers reduced without any reduction being made on account of gas consumed in the street-lamps, the Town Authorities made application to the Gas Company, some time ago, for a suitable and equitable reduction of the contract price for street-lamps. The Gas Company replied that the price paid by the Commissioners was one-third below that charged to the ordinary consumers, and often much lower than the prime cost at which the Company manufactured the gas; and in the circumstances the Directors were of opinion that any reduction in the contract price for the town was uncalled for, and that, in the interests of all the consumers, as well as of the Company, it was unadvisable. It appears that, although the price to ordinary consumers has been reduced from 7s. 6d. to 5s. 10d. per 1000 feet, the price per lamp to the Police Commissioners still remains at 25s., as in the year 1873.

The annual meeting of the Montrose Gaslight Company was held last Wednesday—Mr. Aberdein, of Keithoch, in the chair. In opening the proceedings, the Chairman made a suitable reference to the loss sustained by the Company through the death of Mr. Robert Walker, who for the long period of 41 years had been a Director, and for 29 years had acted as Chairman and Convener of the Finance Committee, and to whose exertions the prosperity of the Company was greatly owing. Mr. Melville Watt, Treasurer, read an abstract of the income and expenditure for the past year, which showed a surplus of £2028 3s. 7½d., out of which the Directors recommended that a dividend at the rate of 7½ per cent. on the capital stock, or £3 per share, should be declared—being the same as last year. The recommendation was agreed to.

At the annual meeting of the Kirriemuir Gas Company, which was held on Thursday, a dividend and bonus were declared at the same rate as formerly—namely, 6 per cent. and 2 per cent.; and the price of gas was continued as during the past year—6s. 8d. per 1000 feet. Certain alterations and improvements in the works were authorized.

The Broughty Ferry Police Commissioners had the question of the gas supply under consideration at their ordinary monthly meeting, which was held last Monday. Considering the rapid increase in the consumption of gas within the burgh, the Manager strongly recommended a material increase in the producing and storing plant. His recommendations were generally approved of, and a Committee was appointed to consider and report as to whether a Provisional Order should be applied for.

At a meeting of the Burntisland Town Council, held last Thursday, the agreement for the transfer of the North British Railway Company's Gas-Works to the Municipal Authorities was submitted and approved of, and Mr. Whimster, gas engineer, Perth, was appointed to value the materials on hand when possession of the works is obtained by the Council on the 1st proximo.

The annual meeting of the Stewarton Gaslight Company was held last Thursday—Mr. James Love in the chair. After setting aside a handsome amount for the reserve-fund, a dividend of £1 on the original £5 shares was agreed to.

The forty-ninth annual general meeting of the Kirkcaldy Gas Company was held last Wednesday—Mr. D. Nelson in the chair. The Directors report was unanimously approved of, and the price of gas was reduced from 4s. to 3s. 9d. per 1000 feet, commencing from the last meter survey.

A meeting of the Police Commissioners of Wishaw was held last Monday evening—Provost Anderson in the chair—when the subject of the transfer of the gas supply undertaking was under consideration. The claim of the Gas Company for their works stated that their average profits had been 8 per cent., and that the capital was £6200, in addition to a bond of £1100. The Company ask (including bond) £16,729 for their works, or 9½ per cent., which sum is based on the average profits of the last three years capitalized at 25 years purchase. The matter was remitted to the Law Committee, their Clerk, and Engineer, to prepare defences.

The first annual statement of accounts on the gas supply undertaking of Dumfries since the Town Council acquired the gas-works has been published. The capital account was £25,000, of which £23,027 2s. 5d. had been expended, leaving a balance of £1972 17s. 7d. The total revenue was £8272 1s. 7d., and the expenditure £9278 9s. 2d.—deficiency, £1006 7s. 7d. It was expected that this year there would be a saving of £2000 on coals, with the new retorts that had been erected, and the cost of which was included in the expenditure.

The Glasgow pig iron warrant market was firmer last week, and rather a better tone prevailed. A moderate amount of business was done, and the best prices were maintained at the close on Thursday afternoon—namely, 40s. 6½d. to 40s. 6d. cash. The Glasgow Fair Holidays are on just now, and business is suspended.

No improvement can be reported in regard to the coal trade, the demand being still very dull, and the prices exceedingly low.

WORKSOP GAS COMPANY.—The annual meeting of this Company was held on Monday, the 14th inst.—Mr. T. Marris in the chair. The Directors report, with the statement of accounts for the past year, were presented and unanimously adopted. Full dividends upon all the stock of the Company were announced. Messrs. Scaife and Nicholson were unanimously re-elected upon the Board. The Directors the previous week decided to reduce the price of gas from 4s. to 3s. 9d. per 1000 feet.

ATHENS GAS-WORKS.—We hear that Mr. Charles H. Hutchinson, son of Mr. John Hutchinson, of Barnsley, has resigned his appointment as Engineer to the Athens Gas Company, and will shortly return to England.

PRESTON GAS COMPANY.—At the half-yearly meeting of this Company, held on Monday, the 14th inst.—Mr. J. B. Booth in the chair—the ordinary dividends of 10 per cent. on the A stock, and 7 per cent. on the B stock were declared.

ABERYSTWITH WATER SUPPLY.—At a special meeting of the Aberystwith Town Council, on Tuesday, the 15th inst.—the Mayor (Mr. D. Roberts) in the chair—a report was presented by Mr. J. E. Thomas, on the Llyn Llygaid Rhiedol scheme for supplying the town with water, from which it appears that the present area of the lake is 11 acres 3 roods 22 perches, and when dammed up at the outfall the area will be 14 acres. The volume of water at command, presuming the springs which supply the Llyn Llygaid Rhiedol to fail in summer, will be 2,845,000 gallons without the storage by embankment; but including it there will be 56,650,000 gallons, which is equal to 20 gallons per head per diem for a population of 25,000 for 125 days. If, however, the springs be constantly filling the lake, as there is every reason to believe is the case, then the work of damming it would be unnecessary, at least for one generation. It was resolved to apply to the Local Government Board for assistance to the extent of £16,000 in order to carry out the scheme.

SALTCOATS GAS COMPANY.—From a statement of the affairs of this Company, presented to the Shareholders at their meeting on the 2nd inst., it appears that the consumption of gas during the year ending the 30th of April last amounted to 4,192,800 cubic feet, which, at 5s. per 1000 feet, realized £1048 4s.; while residual products sold for £107 12s. 10d. The expenditure included £355 5s. for coals and cartage, which was equal to 1s. 7½d. per 1000 feet of gas used; the total ordinary expenditure being £747 16s., equal to 3s. 5½d. per 1000. The "Abstract of Coal Account and Product of Gas," which is appended, shows that during the year 555¼ tons of coal and shale were used, estimated to produce 4,950,625 feet of gas. The actual quantity made, as indicated by the station-meter, was 5,029,000 feet, equal to a little over 9057 feet per ton. The gas used by consumers amounted to 4,192,800 feet; used in 54 street-lamps, 124,200 feet; and used at works, 30,000 feet; thus the unaccounted-for gas was 682,000 feet, or 13·56 per cent. of the make.

EXPLOSIONS OF GAS IN THE METROPOLIS.—On Friday evening last, an explosion of gas occurred at the New Cross Station of the London, Brighton and South Coast Railway, resulting in considerable damage to one of the waiting-rooms, and injury to five persons, who were slightly burned on the hands and faces.—On Saturday morning, about eleven o'clock, an explosion of gas took place in the gas-meter and paint store-room at Somerset House. It seems that some gas-fitters were at work with a naked candle in the room, which is in the lower basement of the building. They detached a pipe from the meter without turning off the gas at the main, and the gas pouring out, became ignited. The window was blown out, and the gas, which was blazing fiercely, set fire to the contents of the room, and created great alarm. Several fire-hose belonging to Somerst House were brought into use, and two or three engines of the Fire-Brigade having arrived on the spot, one of them commenced playing upon the room. In less than an hour from its outbreak the fire was completely extinguished, having been confined to the place where it originated.

OLDHAM CORPORATION WATER SUPPLY.—From a statement prepared by the Superintendent of the Oldham Corporation Water-Works (Mr. Herbert Andrew), and accompanying the last published accounts of the water undertaking, it appears that in the period from Aug. 31, 1878, to March 25 last, £55,932 8s. 6d. was expended on capital account. The water rental during the nine months ending the 25th of March was (including meter hire) £24,570 9s. 9d., against £24,889 5s. 9d. for the corresponding period in the previous year. There was an increase in the water-rents for domestic purposes, &c., of £362 16s. 11d., but a decrease in those for trade purposes, per meter, of £681 12s. 11d. The amount of gross profit was £20,789 10s. 10d., and, after paying therefrom the annuities, the interest on mortgages, and £3646 to the sinking-funds, there remained a net profit of £5553 0s. 4d. From this surplus the sum of £265 3s. had been applied in payment of expenses incurred in connection with the Manchester Corporation (Thirlmere) Water Scheme, leaving a balance of £5287 17s. 4d. for disposal. No alterations were made in the charges for the supply of water during the above period. The number of houses and other premises supplied with water is now 34,648, being an increase during the nine months of 1036. There are 734 water-meters in use, being a decrease during the above period of 14. The length of water-mains laid in extensions, enlargements, and renewals during the nine months was 14,935 yards, and mains taken up 1504 yards. During that period 3824 water-taps were examined and tested, of which 3803 were passed and stamped, and 21 rejected.

PITTENWEEM GAS COMPANY.—With reference to one of the paragraphs in our "Trade Notes from Scotland," in the JOURNAL of July 8, Mr. Alex. Wilkie, Chairman of the Directors of the Company for the past year, writes under date of the 12th inst.: "In your last issue notice is taken of our annual meeting, and you say 'that the affairs of the Company were in a more prosperous condition than at any former period.' That I believe to be correct. However, your correspondent makes a mistake when he credits it to the Manager—Mr. Thomas Nicolson—' by whose faithful stewardship,' &c. Mr. Nicolson is (not Manager) Collector and Secretary, and a thoroughly good man for his department, but has nothing to do with the management of the works, which are under the immediate care of Mr. David Stevens, as Manager, with a Works Committee of three Directors, to whom special thanks were accorded. To Mr. Stevens and his assistants something more tangible was unanimously voted of the year's profits, in recognition of their services in the Company's interests. I should not have troubled you, had the statement not been such as to interfere with the Manager's interest or status in his profession, and also to prevent error. To do so in future years, I will have a copy of our balance-sheet sent you, and, though a small works, it may be useful to others of a like size, in forwarding a wholesome rivalry." From the abstract of the accounts of the Company, for the year ending the 31st of May last, it appears that 2,599,060 cubic feet of gas were sold at 6s. 8d. per 1000, realizing £866 7s. 4d. Meter-rents amounted to £72 17s. 9d., while residual products and sundry receipts of £49 15s. 4d. made a total charge of £1700 16s. 8d. Against this there was a discharge of £349 2s. 6d. for coals and cartage; £334 1s. 4d. for purifying material, wages, &c.; and £280 for dividends. The capital of the Company is £2000.

PAISLEY GAS COMMISSIONERS.—At the meeting of the Paisley Gas Commissioners, last Thursday, Mr. Russell, in moving the adoption of the Gas Trust's balance-sheet, and the reduction of the price of gas from 4s. 2d. to 3s. 9d. per 1000 cubic feet, made a few remarks on the prosperity of the Trust's affairs. He said that the revenue from the works in 1845, when the town first had an interest in them, was £8798; in 1870, when they passed into the entire control of the Trust, the revenue from the sale of gas alone was £15,664. In 1845 the price was 6s. per 1000 feet, in 1870 it was 3s. 9d. From 1845 to 1879 the works were managed by a Joint Board of the Town's Trust and the Shareholders, and in that period the works yielded surpluses to the extent of over £40,000. Of this sum, £15,398 was apportioned to the extension of the works; £12,651 was invested in the Company's stocks; and the balance was handed over to the Trust for a sinking-fund. Since 1870 they had surpluses to the extent of £16,000 odd, £5000 of which was placed to the sinking-fund. At present they had £7000 less debt on the works than in 1845, with appliances for making nearly five times the amount that could be produced then. They were quite in a position to reduce the charge from 4s. 2d. to 3s. 9d. per 1000, and the Manager (Mr. G. R. Hislop) had assured him that, even at this rate, they might expect a surplus for the year as large as that of the past year—namely, £2800, with £3000 carried to the sinking-fund. Bailie Halden seconded the adoption of the minutes, and the recommendation to reduce the price of gas, both of which were agreed to. It was afterwards resolved to set aside £1000 of the gas profits for street improvements.

THE WATER SUPPLY OF MANCHESTER AND LIVERPOOL.—On Friday, the 13th ult., a deputation from the Liverpool Water Committee waited upon the Manchester Corporation Water Committee with the object of ascertaining if the Corporation were disposed to enter into an agreement with the Corporation of Liverpool, either for a supply from the Thirlmere aqueduct for a term of years, or for joint action in the construction of an aqueduct from the Lake district. The report of this deputation was issued on Friday, the 11th inst. In reply to the questions of the deputation, the Manchester Committee state that they cannot undertake to deliver water on Jan. 1, 1886, and that they are not prepared to pledge themselves to any date on which they will guarantee the delivery, or to expedite the execution of their works, without some inducement to do so. Without, however, pledging themselves to any date of commencement, the Manchester Committee express their willingness to negotiate with the Liverpool Corporation, either for a permanent supply of water for Liverpool, or a supply for a period upon a fixed annual payment, and they also state that, subject to the application being made before the completion of the first instalment of the works, they are prepared to admit that Liverpool is entitled to a supply under the 31st section of the Manchester Corporation Water-Works Act, 1879, and that such supply as regards price will be upon the following terms, based upon a calculation by the Manager of the Manchester Water-Works:—

Estimated Cost of Works for		Cost of One Million Gallons.	Annual Charge for One Million Gallons per Day.
10 million gallons daily	£2,000,000	£30 2 8	£11,000 0 0
20 " " "	2,500,000	18 3 0	6,625 0 0
30 " " "	3,000,000	14 3 1	5,166 13 4
40 " " "	3,500,000	12 3 1	4,437 10 0
50 " " "	4,000,000	10 19 2	4,000 0 0

PRESENTATION TO MR. J. GIBSON, OF DOLLAR.—On Friday, the 4th inst., the Shareholders of the Dollar Gas Company presented Mr. James Gibson, banker (who has been intimately identified with the Gas Company from its beginning in 1845) with a testimonial. Mr. Leishman, as Chairman of the Company, made the presentation in a few appropriate remarks. He spoke of the long and faithful services of Mr. Gibson in connection with the Gas Company, of the interest he had all along taken in its affairs, and referred to his excellent business capacities, and to his upright and straightforward character. The testimonial consisted of a handsome black marble Florentine bronze-mounted dining-room clock, striking the hours and half-hours on a double gong; also a pair of large Medici vases and bronze bust of Roma to match. An appropriate inscription was engraved on the clock. Mr. Gibson having, in acknowledging the gifts, tendered his hearty thanks to the Shareholders for their present, adverted to the commencement of the Company, and to the difficulties which they had to encounter in getting land. After ground had been obtained, and the works were erected, they met with another difficulty as to the raising of funds to set the works a-going. Mr. Leishman very kindly came forward with a great part of the necessary funds, and thus they were enabled to proceed with the undertaking. For a long time it was not a success, so far as profit was concerned, as no dividend was paid for a good many years. Still, with perseverance and carefulness in the management of affairs, the undertaking by-and-by began to show signs of progression, and gave some return to the Shareholders. He might add that it had now arrived at such a point that it was rather an envy to the people who had sold their shares, and who would very much like to get them back, if they could, at the old price. Many who were Shareholders at the commencement had sold their shares when there was no dividend, whilst Mr. Leishman and himself did not scruple to buy them up, and now they were reaping their reward. Mr. Gibson then gave some reminiscences of the former membership of the Company, referring to the able assistance received from many who now had passed from this life. When the Company was commenced in 1845, the price of the gas was 10s. per 1000 feet, and there was no dividend for years; now, however, the price was 6s. 8d. per 1000 feet, with a dividend of 10 per cent.

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

2860.—PITT, S., Sutton, Surrey, "Improvements in the productions of hydrocarbons, such as benzole, toluole, xyole, naphthaline, anthracene and their homologous substances which are suitable for the manufacture of colours." A communication. July 14, 1879.

2871.—ALLEN, S. B., Massachusetts, U.S.A., "Regulating the supply of steam to a steam-engine when used in operating machinery for extracting inflammable gas from one or more retorts employed in the production thereof from bituminous coal or other such gas-yielding matter or matters." A communication. (Complete specification.) July 15, 1879.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

211.—RAPIEFF, J., Middle Street, London, "Improvements in the means of producing and applying electric currents for lighting and other purposes, and in apparatus employed therein." Jan. 18, 1879.

299.—HADDAN, H. J., Westminster, "Improvements in apparatus for producing light by electricity and other means." A communication. Jan. 24, 1879.

1234.—SPENCER, S., Southwark, London, "Improvements in coronets, domes, and covers for globes and other forms of glasses for gas-lights." March 28, 1579.

PATENT WHICH HAS BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

1964.—RUSS, B., "Improvements in the manufacture of gas, and in the treatment of the residues therefrom, in the means of purifying and rectifying the same, and in the combination or amalgamation of gases, for the production of light and heat, and for other useful purposes, and in the machinery and apparatus to be employed therein." June 29, 1872.

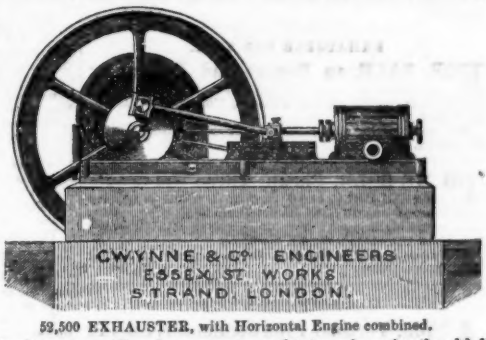
The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

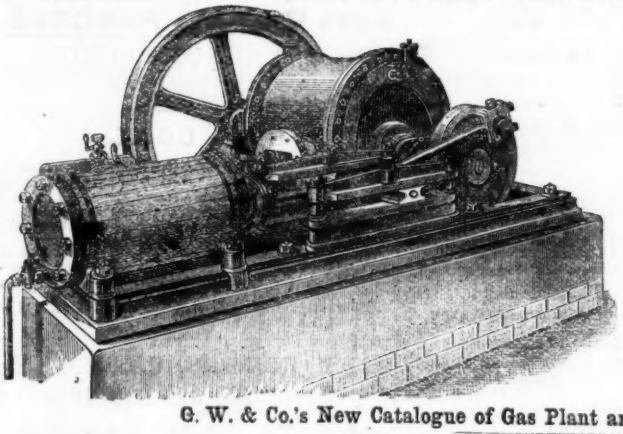
Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,

WITH

Wrought-Iron Spindles and

ENGINES COMBINED.



SOLE MAKERS,

GEORGE WALLER & CO.

MAKERS OF ENGINES, EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

Phœnix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.

TO GAS ENGINEERS.

D. BRUCE PEEBLES & CO.

Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

TAY WORKS, BONNINGTON, EDINBURGH.

WANTED, Readers of the NEW Edition, 1879, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, A.I.C.E., Gas-Works, SYDENHAM, S.E.

WANTED, Masonic Votes on behalf of a Child of the late Bro. John Johnson, who was a Subscribing Member of the "Evening Star Lodge," No. 1719, and a Member of the British Association of Gas Managers.

Votes received by Bro. MAGNUS OHREN, Lower Sydenham, KENT, Secretary of the Lodge.

WANTED, by the Hinckley Gas Company, Limited, a practical Competent MANAGER. (Annual make about 17 millions.) Must understand Gas-Fitting. Gas-Engine and Exhauster in use. Salary about £100 a year, with house, coal, gas, and rates free.

Applications, with qualifications and testimonials, to be sent to the undersigned by the 25th inst.

None need apply whose character for honesty and sobriety will not bear the strictest inquiry. The whole time to be given to the duties.

W. G. FARMER, Chairman.

Hinckley, July 11, 1879.

WANTED, a Situation as Manager of Gas-Works. Has had many years practical experience in the Erection and Management of Gas-Works at Home and Abroad. Good testimonials.

Address W. S., care of Mr. John Clarke, Chilcompton, SOMERSETSHIRE.

A Manufacturer of Chemicals and Greases having had to buy out partner, wishes to meet with Practical Chemist with about £600. Established business. Right in centre of coal-fields. Highest references given and required.

Address No. 561, care of Mr. King, 11, Bolt Court, Fleet Street, LONDON, E.C.

WANTED, by the Dumfries Gas Commissioners, a FOREMAN for the Works, under the Manager.

Applicants must be able to do Smith Work, Engine Work, Plumbing, Gas-Fitting, and Pipe-Laying, to Inspect and Repair Meters, Wet or Dry. Wages from 25s. to 40s. per week, according to ability. Applications, with certificates, to be lodged with WILLIAM MARTIN, Town Clerk to the Commissioners, on or before the 1st of August.

Dumfries, July 11, 1879.

GAS-METERS.

A Gentleman with a good connection among Gas Companies in the North and Midland Counties, and well acquainted with the business, wishes to Represent a Good Firm in Dry and Wet Gas-Meters. Commission and expenses.

Address A. Z., care of W. H. Bennett, Esq., 22, Great George Street, Westminster, LONDON, S.W.

TO GAS AND WATER COMPANIES.

THE Advertiser, aged 26, experienced in Gas and Water Office Accounts and Routine, desires to meet with some suitable appointment as CLERK, COLLECTOR, or similar capacity connected with a Gas or Water Company. Seven years experience; references or testimonials.

Address, THOS. GILL, 185, Burnley Road, ACCRINGTON.

SECOND-HAND Gas Plant Wanted, in Good Condition.

Two Purifiers, 6 ft. by 6 ft. by 3 ft. or 3 ft. 6 in. Scrubber, 7 to 8 ft. high, about 4 ft. in diameter. Condenser, 10 or 12 pipes, 7 or 8 in. in diameter.

Address J. SMEDLEY, Lea Mills, near DERBY.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

EXHAUSTER FOR SALE.

FOR SALE, an Engine and Exhauster combined, to pass 7000 feet per hour, together with Boiler, 12 ft. by 4 ft., Boiler Fittings, Connections, Regulator, and Stone Bed.

For particulars, apply to W. T. Tew, Gas-Works, Warwick.

TO BE SOLD, Cheap, Three Telescopic GASHOLDERS, two 60 ft. diameter and 20 ft. deep each lift, and one 70 ft. in diameter and 20 ft. deep. Only been in use eight years. May now be seen at work at the Effingham Street Gas-Works, Sheffield.

For price, apply to Thomas Piggott and Co., Spring Hill, Birmingham.

GAS PLANT FOR SALE.

A 10-in. Vertical Pipe Condenser, having 20 Pipes, each 19 ft. high, on Cast-Iron Base Box.

A Scrubber, 16 ft. high 5½ ft. diameter, fitted with thin boards, Self-Acting Liquor Distributor, 10-in. inlet and outlet pipes.

Two Single-Flue Cornish Boilers (new in 1870), each 9½ ft. long, 3 ft. 9 in. diameter; Fire Tube of Low Moor Iron, complete with all Fittings.

All in good working order; removed to make room for larger plant.

For further particulars apply to Thos. Trewhitt, Gas-Works, West Hartlepool.

May 8, 1879.

GAS COAL.

TENDERS are required for the Supply of 3000 Tons of Pelaw Main, New Pelton, or other first quality Durham GAS COAL, delivered in barges at Nine Elms. 1400 tons in the year ending June 30, 1880, 1600 tons in the year ending June 30, 1881.

Tenders to be delivered by the 1st of August next to Wilson and Douglas, Aldershot.

BURGH OF DUMFRIES.

THE Gas Committee of this Corporation will receive ESTIMATES for the Supply of from 1000 to 2000 Tons of Auchlochan, 1000 Tons of Dykehead, and from 500 to 1000 Tons of No. 1 Muirkirk CANNEL COAL, to be delivered at the Dumfries Station, carriage paid. Payment to be made monthly, after delivery.

Offers to be lodged with William Martin, Town Clerk, Dumfries, on or before the 2nd of August next.

Dumfries, July 18, 1879.

GASHOLDER FOR SALE.

THE Sleaford Gas Company, Limited, have for disposal a GASHOLDER, 32 ft. in diameter by 14 ft. deep, with Counterbalance Weights and Chains, Stone Columns, 5-in. Inlet and Outlet Pipes, Syphons, and Slide-Valves, all complete; the whole in splendid condition, and at present in use. To be moved to make room for extensions.

Can be seen, and full particulars obtained, on application to the undersigned.

By order,
Harry Wimhurst, Manager.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Oldham Corporation Gas-Works Committee are prepared to receive TENDERS for the Supply of about 4000 Tons of CANNEL and 16,000 Tons of Coal.

Particulars may be obtained on application to Mr. Herbert Andrew, Gas Offices, Oldham.

Tenders to be sent in on or before Tuesday, July 29, 1879.

By order,
H. Booth, Town Clerk.

Oldham, July 16, 1879.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—

110 Mouthpieces, D-shape, 13 in. by 22 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes. Also about 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. 28 Mouthpieces, D-shape, 16 in. by 20 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12 in. Slide-Valves and 12 in. Connections.

Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12 in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.

Exhauster (Beales) to pass about 25,000 feet per hour.

Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.

Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.

Three 4-in. Pumps, with cranked Shafting and a pair Mitre Wheels.

Set of four Purifiers, 12 ft. by 12 ft. by 4 ft., with 12-in. Centre-Valve (Cockeys), and Connections and Lift complete.

Station-Meter by A. Wright and Co., London, with three 12-in. Slide-Valves, and 12-in. Bye-Pass and Connections, to pass about 25,000 feet per hour.

Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.

Gasholder, Double Lift, capacity 240,000 feet.

Two 12-in. Governors, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned.

R. Morland, Engineer.

TOWN of LLANTRISSANT, GLAMORGANSHIRE.

VALUABLE GAS-WORKS FOR SALE.

TO be Sold by Public Auction, by order of the Mortgagees, in One Lot, at the Royal Hotel, in the town of Cardiff, in the county of Glamorgan, on Aug. 19, 1879, at Two o'clock precisely in the afternoon, the following valuable and well-constructed Freehold and Leasehold Gas-Works, the property of the Llantrissant Gaslight and Coke Company, Limited, viz.:—

All that piece of Freehold Land containing an area of 1622 Square Yards or thereabouts, together with the Gas-Works and Manager's Dwelling-House erected thereon, and all the Plant, consisting of Gasholder, Retorts, Purifiers, Condenser, Scrubber, Governor, Steam-Boiler, Exhauster, Mains, and other Machinery usually employed in the Manufacture and Supply of Gas. Also all that piece of Leasehold Land containing an area of half an acre or thereabouts, together with the Gas-Works, Cottage, and similar Machinery to the above. Also Pillars and Brackets with Lamps for Lighting Public Streets, and a large quantity of Meters and several thousand yards of Mains. Also about 198 Yards of 3-in. Cast-Iron Pipe in 9 ft. lengths, stowed at the Works.

The leasehold premises are held for a term of 99 years from Aug. 2, 1875, under a lease granted by Vaughan Hanning Vaughan Lee, Esq., M.P., at the yearly rent of £20.

The freehold and leasehold Works are connected, and gas can be supplied to the whole of the district of supply from both or one of them.

The freehold Gas-Works have been in operation for upwards of 12 years, and the leasehold portion was recently added to meet the increased requirements of the district.

The town of Llantrissant is situated within the South Wales mineral basin, and is 12 miles distant from Cardiff.

The works have been supplied with superior gas coal from neighbouring collieries at moderate prices, and gas is supplied to the stations of the Llantrissant and Taff Vale Junction Railway, and to the station, offices, and signals of the Great Western Railway at Llantrissant, besides a large tin-works and waggon works and the houses in the town of Llantrissant, and the villages in the immediate neighbourhood thereof.

Further particulars, plans, and conditions of sale can be had of Messrs. Spickett and Price, Solicitors, Pontypridd, Glamorganshire.

GOVERNOR FOR SALE.

THE Shanklin Gas Company, Limited, have FOR DISPOSAL a nearly new 8-in. Air Vessel Concentric GOVERNOR, with six Ornamental Pillars, 8-in. Four-way Bye-pass Cock with Connections. Makers, Messrs. W. and B. Cowan. To be moved to make room for extensions.

Can be seen and particulars obtained on application to W. Sutherland, Secretary.

THE Gas Committee of the Leeds Cor- poration are prepared to receive TENDERS for the Supply of MATERIAL required over a period of One year only:—Native Oxide of Iron, at price per ton, delivered at Meadow Lane Gas-Works. Prepared Oxide (free from acid), to be delivered at New Wortley. The spent material to be removed by the Contractor when charged with 47 per cent. of sulphur.

Samples of every description offered, and guaranteed analysis of bulk to be forwarded to Mr. Woodall.

Tenders, addressed "Chairman, Gas Office, Boar Lane," to be sent in not later than the 28th inst.

ORMSKIRK GASLIGHT COMPANY.

TO BUILDERS AND CONTRACTORS.

THE Directors are prepared to receive TENDERS for the Erection of Brick PURIFYING-HOUSE (with wrought-iron roof), METER-HOUSE, PURIFIERS, &c., together or separately.

Plans, &c., can be seen on application to Mr. Martin, at the Works, Aughton Street, Ormskirk.

Sealed and endorsed tenders to be sent to me not later than the 6th of August next.

The Directors do not bind themselves to accept the lowest or any tender.

Wm. Parr, Secretary to the Company.

2, Railway Road, Ormskirk, July 17, 1879.

WIDNES GAS-WORKS.

THE Gas Committee of the Widnes Local Board invite TENDERS for Replating the Roof of a Single-Lift Gasholder, 80 ft. in diameter.

Specification and form of tender may be seen at the Engineer's Office at the above works.

Tenders, endorsed "Gasholder," and addressed to the Chairman of the Gas and Water Committee, to be delivered at the Public Offices, Widnes, not later than the 30th of July.

The Board do not bind themselves to accept the lowest or any tender.

Henry Roberts.

Public Offices, Widnes, July 7, 1879.

TO Gas Managers.—If you want Good Heats, try R. Andrews's Principle of Retort-Setting. Estimates given for Building new Benches.

114, Elsley Road West, Shaftesbury Park, London, S.W.

AMMONIACAL LIQUOR.

THE Directors of the Wakefield Gas- light Company are prepared to receive TENDERS for the Purchase of the AMMONIACAL LIQUOR produced at their Works during the period of One year, commencing Sept. 1, 1879. Estimated quantity, 2200 tons.

Sealed and endorsed tenders to be sent in not later than Saturday, the 16th of August next.

Any further information may be had from the undersigned.

By order,
John W. Whitaker, Manager and Secretary.

Gas Office, July 14, 1879.

TO COLLIERY PROPRIETORS, COAL MERCHANTS, AND OTHERS.

THE Directors of the Alton Gas and Coke Company invite TENDERS for the Supply of 850 Tons of Good GAS COALS, to be delivered, carriage paid, on rails at Alton Station (L. & S. W. R. Co.), in quantities as under:—

250	Tons during the month of	September,	1879.
300	,,	,,	December ,,
200	,,	,,	February, 1880.
100	,,	,,	March, ,,
850			

The Coal to be of good quality, free from bats, bind, pyrites, and other refuse.

Tenders to state from what colliery the coals are obtained, Terms of payment, cash at a month.

The Directors do not bind themselves to accept the lowest or any tender.

Tenders to be sent in not later than Monday, July 28, 1879.

H. W. Elliott, Secretary.

THE

IMPERIAL METER CO.,

LIMITED,

(Formerly Walter Ford, at Gray's Inn Road),

KING'S ROAD, ST. PANCRAS,

Manufacturers of THE IMPROVED DRY GAS-METER, THE PATENT WET GAS-METER, Special Meters for Public Lighting, STATION-METERS, Governors, &c.

GAS COAL.

THE Tawd Vale Colliery Company, Limited, are prepared to Contract for the Supply of their superior Arley and other GAS COALS, and to send samples to the order of Gas Engineers and others, or complete analysis on application. Shipped at Liverpool, Preston, Fleetwood, Garston, or Birkenhead.

Mr. James Paterson, C.E., F.G.S., in his analysis of T. V. Arley Coal, says: "Some parts merge into a semi-Cannel; Gas per ton, 10,300 cubic feet; illuminating power, 16·96 candles; coke of high quality, 1431 lbs. per ton."

Collieries, Skelmeradale, near Ormskirk; Offices, 5, New Hall, Old Hall Street, Liverpool.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. Romans has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

Analysis and Prices forwarded on Application.

Now ready, price 10s. 6d.,

AN ANALYSIS OF THE

METROPOLITAN GAS COMPANIES ACCOUNTS

For the Year 1878,

(In continuation of the previous Eight Years, 1869–1877,)

COMPILED AND ARRANGED BY JOHN FIELD,

For Many Years Accountant to the Late Imperial Gas Company.

Can be had of W. KING, Office of "Journal of Gas Lighting," 11, BOLT COURT, LONDON, E.C.;

AND OF

EDEN FISHER & CO., Stationers, 50, LOMBARD STREET, LONDON, E.C.

J. & H. ROBUS,

BUILDERS AND CONTRACTORS

FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,

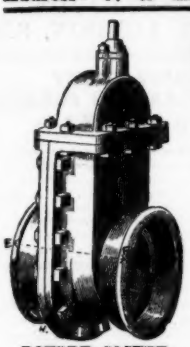
RETORT-SETTING—A SPÉCIALITÉ.

ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.

ESTIMATES GIVEN FOR MAIN-LAYING.

N.B.—All kinds of Fire Goods and Gas Apparatus supplied on the shortest notice.

Address:—J. & H. ROBUS, BELL GREEN, CATFORD, LONDON, S.E.



DOULBE SOCKET.

IMPROVED SCREW-VALVES,

For Water, Tar, Ammoniacal Liquor, &c.

MADE EITHER WITH FLANGED OR SOCKET ENDS.

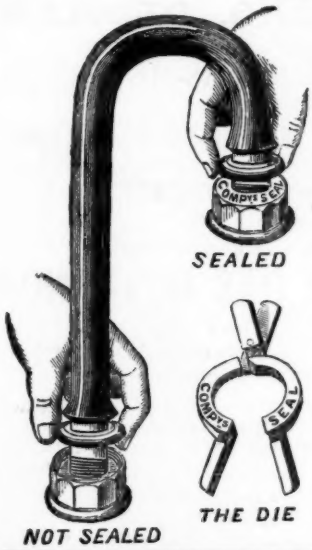
B. DONKIN & Co.

BERMONDSEY, LONDON, S.E.

FOULGER'S PATENT

COUNTER-SUNK SEAL GAS-METER UNIONS,

As Supplied to The Gaslight and Coke Company.



SEALED

THE DIE

NOT SEALED

These Unions practically place a Gas Company's property under lock and key, by rendering it impossible to disconnect at any joint at which gas could be obtained unregistered, without destroying the Company's seal or signature, whilst a small cover absolutely protects the impression from accidental injury.

A meter having been fixed with one of these Unions on the main-cock, and another on the inlet, a few pinches of specially prepared crushed sealing-wax is placed in the cup, and being melted with a blow-pipe, the wax runs between the reversed threads, the circular tong-shaped die will then give a sharp impression of the Gas Company's title, an operation requiring about two minutes in all to perform.

If heat is applied for the purpose of unsoldering the joints, the wax is instantly fused, and the impression, of course, lost.

Are supplied in all sizes, either as Caps and Linings or Barrel-Unions, and at a small additional cost over existing connections.

For further Particulars, Samples, &c., apply to the Sole Agents,

WIGGINS & RIHLL,

VICTORIA DOCK ROAD, LONDON, E.

HENRY LYON (14 years Engineer and Manager of the largest of the Manchester Corporation Gas-Works) Mechanical and Consulting Gas Engineer, reports upon the condition and value of Gas-Works, supplies plans and specifications of all Apparatus appertaining to Gas-Works, and re-models existing Works.

Address Brooklyn, near Halliwell Lane, Cheetham Hill Road, MANCHESTER.

W. LIDDALL,

Public Accountant,

MOORGATE STREET CHAMBERS,

GREAT SWAN ALLEY,

MOORGATE STREET, E.C.

Mr. ROBERT DEMPSTER,

CONSULTING GAS ENGINEER,

ELLAND, near HALIFAX,

May be consulted on all matters connected with Valuations, Arbitrations, and Parliamentary Applications connected with Gas-Works. Having been engaged on extensive Arbitration Cases, which, combined with his experience in Construction and Contracting, his knowledge of Engineering and Valuations is both extensive and reliable.

ALFRED LASS, F.I.Accts.,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

30, GRACECHURCH STREET, LONDON.

Accounts Analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

TO MAKERS OF SULPHATE OF AMMONIA AND BUYERS OR SELLERS OF GAS LIQUOR.

F. SUTTON & CO., Norwich, are now prepared to Supply a Set of Apparatus with Standard Test Solutions for the rapid and accurate analysis of Gas Liquor, which can be used by any intelligent workman, so as to show the actual amount of Sulphate which can be got out of any sample of liquor in a few minutes, without any of the annoyance arising from saturation with acid, &c. Tables are also given, showing the quantity of acid of various strengths required for any given liquor, the accurate ounce-strength and percentage of pure ammonia, &c. Price of the set, with full direction and table (copyright), with materials sufficient for fifty analyses, £4 4s.

Post orders or cheques to be made payable to F. SUTTON AND CO., Manufacturing Chemists, NORWICH, who also supply every description of Standard Solutions for Volumetric Analysis of Waters, Beers, Manures, &c., of guaranteed accuracy.

CLOTH GAS-BAGS FOR MAINS,

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather, India-Rubber, and Gutta-Percha Machine-Bands, Sheet and Washers, and Steam Joints.

T. BUGDEN, Manufacturer,

107, GOSWELL ROAD, LONDON, E.C.

ECONOMY IN THE PRODUCTION OF GAS, AND CARBON DEPOSIT ENTIRELY PREVENTED.

PLUTONIC CEMENT,

FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.

A Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

WILLIAM RICHARDSON, Gas and Hydraulic Engineer, CHARLES HENRY STREET, and BISSELL STREET, BIRMINGHAM.

Now Ready, Price One Guinea,

PRECEDENTS IN PRIVATE BILL LEGISLATION

AFFECTING GAS AND WATER UNDERTAKINGS.

COMPILED BY MR. G. W. STEVENSON, C.E., F.G.S.

This Work contains information with regard to the practice of Parliament during the last fourteen years, in regard to most of the points on which differences arise in Opposed Bills for Gas and Water Undertakings, comprising—Authorized share and loan capital, Rates of dividend, Capitalization of profits, Term for the repayment of loans, Instances in which new shares are to be sold by auction and Exceptions to the Standing Order requiring new shares to be sold by auction, The limitation of back dividends, Illuminating power, Purity, Price, Notice before testing, The conditions under which the public supply of gas is regulated, Alteration of mains, Instances in which maps of mains are required, and All cases in which undertakings have been transferred, since 1845 in gas and 1865 in water, from Companies to Local Authorities.

In the Water Precedents will be found, in addition, The rates for a supply for domestic purposes, and the Rates for other than domestic purposes.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

Prices are Reduced.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,
CANNEL COAL MERCHANT,
HAYMARKET, EDINBURGH.
Established 1840.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & CO., GHENT, will receive immediate attention.

JAMES NEWTON & SONS,
(Established 1820,)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.,
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for
GAS AND WATER WORKS.

TORBAY AND DART PAINT COMPANY, LIMITED.

WORKS:
DARTMOUTH & BRIXHAM (TORBAY) DEVON.
OFFICES:
23, GREAT GEORGE STREET, WESTMINSTER LONDON, S.W.

SOLE PROPRIETORS AND MANUFACTURERS OF
WOLSTON'S CELEBRATED
TORBAY IRON PAINTS.

TRADE MARK

These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Wagon Works, and the Paint Trade generally. They are the BEST PROTECTORS of WOOD, CEMENT, and IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to iron. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only to be thinned down for use in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
Dart Yellow.	Buff.
Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead Colour.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
Light Green.	Iron Grey.

All other Colours made to order.

READY-MIXED PAINTS.

A great variety of Colours ready mixed for the brush are also always kept in Stock, in 3 lb., 7 lb., 14 lb., and 28 lb. cans.

Prices and Testimonials on application.

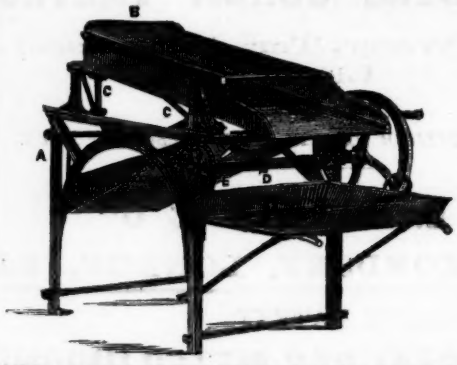
GAS *v.* ELECTRIC LIGHT.

WIGHAM'S PATENT GAS-BURNERS
FOR
STREET LIGHTING, &c.

Speaking of these burners, erected on the Thames Embankment by Westminster Bridge, the *Daily News* says:

"A blaze of light is thrown out, which, in point of efficiency and brilliancy, far surpasses the large gas-lamps lately erected in Waterloo Place, *while even the electric lights are quite thrown into the shade.*"

SOLE MANUFACTURERS:
J. EDMUNDSON & CO., GAS ENGINEERS,
19, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.



PRICE'S PATENT
LABOUR-SAVING SCREEN OR SIFTER.

In screening breeze, the coarse material falls on a tray supported by the handles of the Machine, thus making it convenient for picking the clinkers from the same, whilst the fine falls on a shoot behind, which is fixed to the bottom of the sieve B. In screening gravel or other material, the coarse will fall into a barrow direct, and the fine be conveyed by the shoot into a barrow at the other end, or at the bottom.

To practical men the advantages of this Machine will be evident. It secures at once a saving of time, labour, and expense, as by it a much greater quantity of material can be sifted in the same space of time.

Further particulars as to price, &c., may be obtained by applying to the Patentee (Hampton Wick), or to

ROBERT DEMPSTER & SONS,
(SOLE MANUFACTURERS),
ELLAND, NEAR HALIFAX.

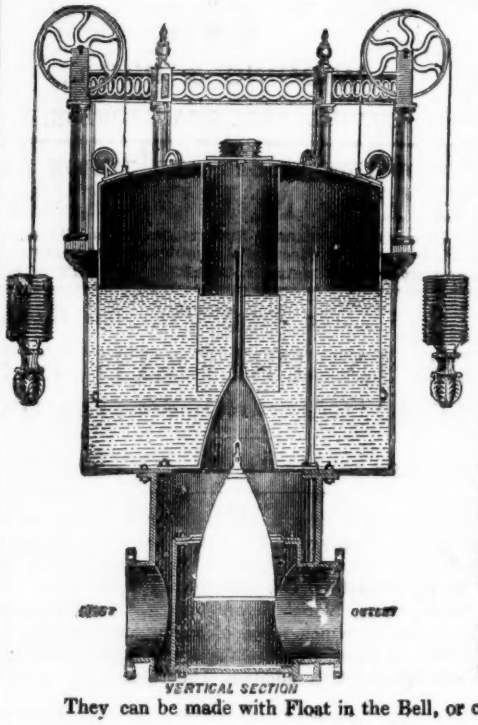
J. & J. BRADDOCK,
GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF
WET AND DRY CONSUMERS GAS-METERS,
OF THE HIGHEST EXCELLENCE ONLY;
ROUND STATION-METERS,
ON CAST-IRON STANDS;
SQUARE STATION-METERS,
WITH PLANED JOINTS.

Messrs. BRADDOCK beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



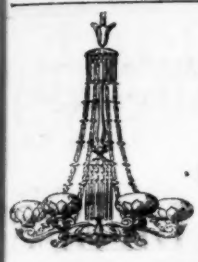
VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 30-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.



F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

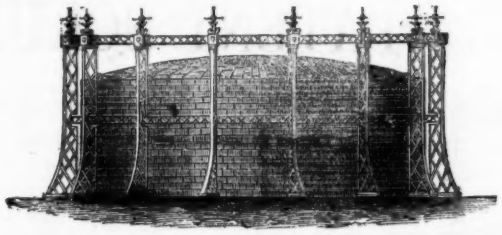
ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS.

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

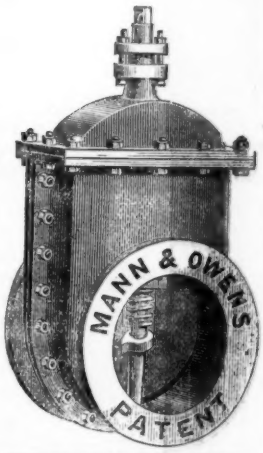
ALSO

MAKERS OF ROOFS, BRIDGES, &c.

MANN & OWENS' PATENT GAS-VALVE.

VALVE, with Indicator for Above Ground.

EVERY VALVE WARRANTED TO BE PERFECTLY SOUND AND GAS-TIGHT.



UNDERGROUND VALVE.

The advantages of this Patent Valve over all others yet introduced are, that it is always as tight as the best wedge or spring valve, without the possibility of setting fast or becoming suddenly leaky. The surfaces not being in contact during the operation of opening or closing, leakage through wear and tear is avoided.

The Gas Engineer will not fail to see the importance of such a valve in connexion with his purifying apparatus, particularly in the case of large sizes.

The slide being operated either by a screw and nut, or by a pinion and rack, a cam bearing upon a plane, cast on the back of the Valve, forces it against the face, and renders the escape of gas an impossibility. By a slight turn of the pinion or screw, the slide is released, and brought away from the face, by which means friction is avoided, and the only force required to open the Valve is that due to its own weight.

SOLE MANUFACTURERS:

S. OWENS AND CO.,

HYDRAULIC AND GENERAL ENGINEERS,

WHITEFRIARS STREET, LONDON, E.C.

PRICES, SIZES, AND FULL PARTICULARS ON APPLICATION.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

Established 1799.

ROBERTSONS & CO.,

TWEED IRON-WORKS,

BERWICK-UPON-TWEED.

Makers of Socket, Flange, and Hot-Water Pipes, Tank-Plates, Lamp-Posts, Columns, Girders, and Gas and other Castings.

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,

COTSWOOD FIRE-BRICK WORKS, COTSWOOD-ON-TYNE.

Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

BIRTLEY IRON WORKS,

CHESTER-LE-STREET, DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

THE

SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

TROTTER, HAINES, & CORBETT,

BRETTELL'S ESTATE

FIRE CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.

Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.

Successors to

E. BAKER AND CO., LATE BRIERLEY HILL, STAFFORDSHIRE.

HARPER & MOORES,

PROPRIETORS OF THE

BEST STOURBRIDGE CLAYS,

STOURBRIDGE.

Manufacturers of all Descriptions of

BEST STOURBRIDGE FIRE-BRICKS, LUMPS AND CLAY RETORTS

Of all Dimensions for Gas-Works,

GLASS-HOUSE POTS & CRUCIBLES

ESTABLISHED 1835.

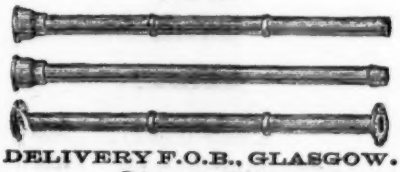
The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture. SILVER MEDAL, PARIS, 1878.

GAS AND WATER PIPES.

WILLIAM MACLEOD & CO.,

30, ST. ENOCH SQUARE, GLASGOW.

CAST-IRON GAS AND WATER PIPES.



DELIVERY F.O.B., GLASGOW.

Prices on application.

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im- portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

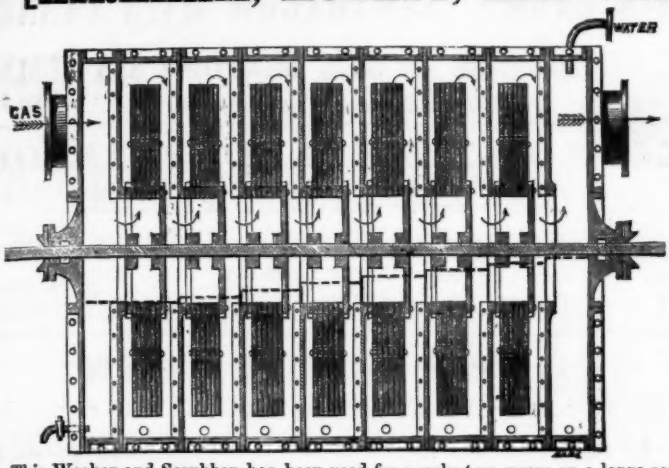
They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

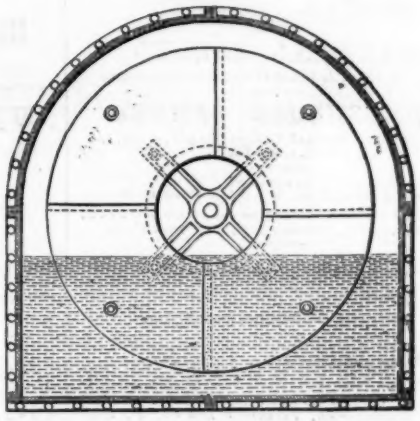
Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

THE

"STANDARD" WASHER & SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]





This Washer and Scrubber has been used for nearly two years on a large scale at the Works of The Gaslight and Coke Company, Bromley-by-Bow, at which station there are now several in operation and in course of construction. There is also one in use at the Pancras Station, King's Cross, of the same Company, which is purifying 1,500,000 cubic feet of gas per day. At the Gas-Works of the Corporation of Leeds, a large one has been erected, which is giving complete satisfaction. The Special Merits of this Washer are as follows:—

That it is a very effective Condenser, so that it is not absolutely necessary to reduce the temperature of the gas to 60°, or thereabouts, to make the Washer effective. That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

D. HULETT, Esq. *The Gaslight and Coke Company, Bromley-by-Bow, May 3, 1877.*

Dear Sir,—In answer to your inquiries respecting the results of the working of your Patent Washer, I beg to state that I find it a very efficient machine. I have had it in operation for some time, and passed gas through it continuously at the rate of 100,000 cubic feet per hour, and obtained from it 11 gallons of 10 oz. liquor per ton of coal carbonized—results which appear to me very satisfactory for so small a Washer. It works very smoothly, taking but little power, and giving no pressure. I have it still in operation, and am perfectly satisfied with its working.

I am, dear Sir, yours truly, (Signed) W. B. WRIGHT.

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Leeds Corporation Gas-Works, York Street, Leeds, Dec. 6, 1878.*

Gentlemen,—The Scrubber-Washer erected by you at these works, and which has been in use for six months, has proved to be, so far as we have been able to test it, thoroughly efficient. We are at present making 32,000 feet of gas per hour, and are entirely dependent on this apparatus for the removal of Ammonia, and the **Gas is perfectly free from that impurity in the sixth chamber,** so that four chambers remain to deal with an increasing make of gas. Owing to insufficient condensers, the gas was in the summer admitted to the Scrubber at a temperature of 70°, but was reduced therein to 61°, or that of the atmosphere. The volutes are driven at the rate of four revolutions per minute, and, working at that speed, there is not the slightest difference between the inlet and the outlet pressure. Clean water supplied at the rate of 10 gallons per ton of coal carbonized is converted into liquor of from 10 oz. to 13 oz. strength **in once traversing the vessel.** The apparatus is extremely simple and compact, occupies but little space, and requires no foundation. I shall be surprised if it does not eventually become extremely popular.

I am, Gentlemen, yours faithfully, (Signed) HENRY WOODALL, Engineer.

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Gaslight and Coke Company, York Road, King's Cross, Jan. 14, 1879.*

Gentlemen,—In reply to your inquiry, I am pleased to say, the Washer which was put in action at this station in October last **has quite fulfilled my expectations,** as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, **it takes out every particle of Ammonia,** while purifying more Gas than it was intended to do. I enclose particulars of a fortnight's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c. (Signed) JOHN CLARK.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmosphere.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 1	8½	6⅔	5	3½	2½	1½	¾	½	0	0	10 Gallons.	52,000	Nil.	77°	73°	48°	24	23	7½
" 2	8⅔	7	6	4½	3½	2½	1½	¾	½	0	10 "	57,000	Nil.	73°	66°	32°	21½	20½	4
" 3	9½	8	6	3⅔	3	2½	1½	¾	½	0	10 "	60,000	Nil.	75°	68°	40°	23½	22	4
" 4	9½	7⅔	6½	4½	3½	2½	1½	¾	½	0	10 "	65,000	Nil.	74°	68°	33°	24	22½	5
" 5	9½	7	6	4	3	2½	1½	1	½	0	10 "	34,000	Nil.	77°	68°	35°	14½	14	5
" 6	9¼	7½	6½	4½	3	2½	1½	1	½	0	10 "	63,000	Nil.	72°	66°	27°	24	22½	4½
" 7	11	9	7	5½	3⅔	3	1⅔	1½	½	0	10 "	59,000	Nil.	74°	66°	31°	25	23½	5
" 8	9½	7½	6	4½	3	2	1	¾	½	0	10 "	78,000	Nil.	73°	61°	31°	28	26½	4½
" 9	11	9	7	5	3⅔	2½	1½	1	½	0	10 "	82,000	Nil.	74°	67°	33°	27½	25½	5
" 10	10⅔	8½	6⅔	5	3½	2½	1½	1	½	0	10 "	66,000	Nil.	76°	64°	28°	28½	27	5
" 11	12½	10	7⅔	5⅔	4½	3½	1⅔	1½	½	0	10 "	61,000	Nil.	78°	64°	27°	26½	25½	5
" 12	11	8½	6⅔	—	—	—	1½	¾	½	0	10 "	39,000	Nil.	74°	64°	27°	26½	25½	5
" 13	13	10⅔	8½	6	4⅔	3½	2	1½	½	0	10 "	78,000	Nil.	73°	65°	42°	28	26	5

Messrs. KIRKHAM, HULETT, and CHANDLER. *Corporation of Birmingham, Gas Department, Saltley Works, May 23, 1879.*

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Working Results obtained from KIRKHAM, HULETT, *and* CHANDLER'S *Patent "Standard" Washer and Scrubber at the St. Pancras Station of The Gaslight and Coke Company, London, March 6, 1879.*

Gas passing per Hour, Cubic Feet.	—	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolution of Apparatus per Minute.	—	No. of Divisions and Strength of Liquor.										Water Used during Experiment. Gallons.
		SH_2	CO_2.	Grains. NH_3.	Washer.	Air.				—	—	—	—	—	—	—	—	—	—	
64,000	Inlet	2·00	2·00	158·8	72	57	21	4½	Twaddel deg. at 60°	5·3	4·9	2·85	2·35	1·7	1·05	0·6	0·3	0·15	0·1	63
	Outlet	1·50	1·50	0·8	68	57	20		Acid, ounces.	11·0	8·4	6·3	4·5	2·7	1·7	1·3	0·7	0·3	—	

WASHER-SCRUBBERS OF THIS PATENT ARE IN COURSE OF CONSTRUCTION FOR BECKTON, BRADFORD, GREENWICH, WOOLWICH, AND SEVERAL OTHER GAS-WORKS.

For further particulars and testimonials, address

Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER.

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CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

THRASHBUSH CANNEL

12,530 cubic feet of 40·32-candle gas per ton, and 9 cwts. of good coke.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

OLD WEMYSS CANNEL

Yields 13,220 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from WEDDERSPOON, FERGUSSON AND CO., 21, Lime Street, LONDON, E.C.

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THE MIRFIELD COAL COMPANY are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of* 16·67 *candle gas, with* 1430 *lbs. of good Coke, per ton.* Ash in Coke, 1·88.

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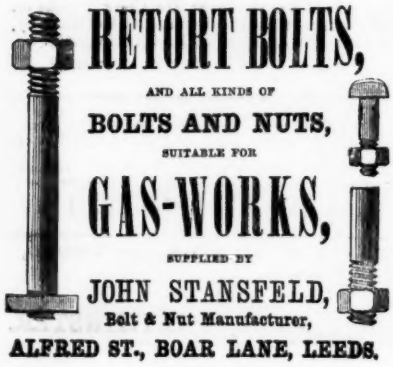

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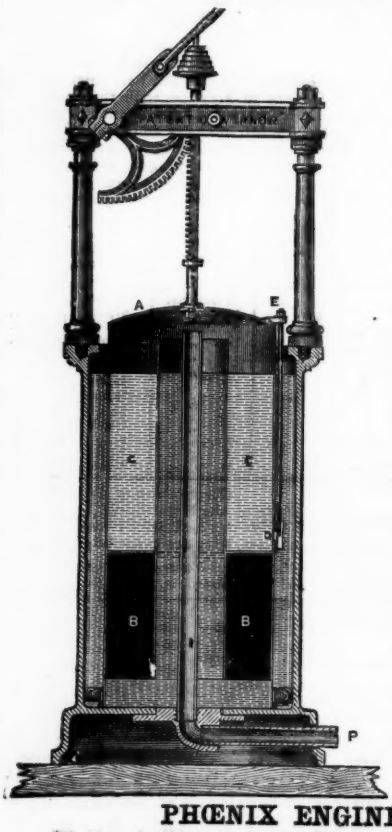

DESCRIPTION OF THE APPARATUS.

The illustration represents a section of the Patent Governor. The lower part of the Bell A is fitted with a loose Float B, and in the upper part of the Bell is a deep annular Water Chamber C, at the bottom of which is an opening D, with a slide outside regulated by a Screw Spindle E, to allow the water to pass in and out of the Chamber C quickly or slowly, according to circumstances, but when once adjusted the slide does **not require altering.** This Self-compensating Chamber gives great steadiness to the up and down movement of the Bell and effectively prevents the "hunting" motion so common with other Governors, thereby ensuring a more perfect action on the throttle-valve of the Engine **than attained by any other.** The sketch shows the clip lever fixed to work on throttle-valve at an angle, and can work in either direction. P is the Gas Inlet-pipe to Governor.

G. W. & Co. also make **special Steam Throttle Valves,** suitable for working with this Governor, and alter existing Throttle Valves to same plan.

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The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.

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SILVER MEDAL
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Being the Highest Honour given for this class.

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SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

NEWTON, CHAMBERS, & CO.,

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NEAR SHEFFIELD.

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The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.

A recent extensive development of the Collieries enables us to offer increased supplies.

JAS. PATERSON, Esq., of Warrington, after testing various qualities of our Coal, has sent the following testimony of their merits:—

"Warrington Gaslight and Coke Company,
Offices, Mersey Street, Warrington, April 23, 1877.

"MESSRS. NEWTON, CHAMBERS, AND CO.,

"GENTLEMEN,—After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

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THE "RELIANCE,"

MANUFACTURED BY THE

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